

IA INTERNATIONAL ASSOCIATION FOR ENERGY ECONOMICS

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Newsletter

Published by the Energy Economics Education Foundation, Inc.

Editor: AMS Inc. Contributing Editors: Paul McArdle, Tony Scanlan and Marshall Thomas

Fall 1997

President's Message



As I end my term as President of the IAEE, I would like to reflect on the past, present and future of the organization. I served on the Program Committee for the first Washington Conference in 1979, and on the International Council beginning in 1987 in many roles, including General Conference Chairman and President of the USAEE before assuming the IAEE Presidency.

During my terms as President and President Elect I have had the opportunity to meet and address sixteen IAEE Affiliates (some more than once) and meet with IAEE members in at least eight more economies. This has been done at the invitation and assistance of Council members and the heads of Affiliates which I have very much appreciated. In almost every instance I found that our Affiliates are healthy, vibrant, and deeply involved in the cutting issues in energy and energy economics – deregulation, privatization, energy security, energy industry structural change, etc. And most important, many of our Affiliate members are creating new approaches to energy economics in a very applied way.

Conferences have been a big part of our success in the last few years. Beginning with the Dallas North American Conference in 1994 and Boston in 1996 and the International Conferences in Washington (1995) Budapest (1996) and Dehli (1997) we have presented high quality programs which combined with good conference management brought critical acclaim to the IAEE as a leader in the world of ideas about energy. Most important was the involvement of both academic leaders and the business and consulting world who initiate, develop and apply those ideas. Indeed, good programs plus good conference management have been the formula for success and good programs have contributed to larger attendance that has made the conferences financially successful.

In addition, Charles Spierer, Pieter Vander meiren, and Edgardo Curcio have made a good start in developing a European conference along the lines of the North American

with the Vienna Conference in July.

The North American Conference in San Francisco in September had mixed results. The USAEE had almost total program and administrative control over this conference and the IAEE is simply a portfolio investor in the success or failure of this conference. From my limited vantage point the program was excellent but I understand that some IAEE members have expressed some reservations about the quality of some of the concurrent and the plenary sessions. My impression is, however, that business and consulting member attendance and support was down. A meeting was held in San Francisco to review this experience and a questionnaire has been sent which needs your urgent attention. We should never lose sight of our need to make good programs better and that good conference management is not enough to maintain our high standards.

(continued on page 2)

Editor's Note

Chauncey Starr notes that a global energy scenario requires a balance of societal trends, economic growth, conservation of energy and resources and conservation of the environment; a "trilemma", as it has been described. Since the interaction of these components makes their projection difficult and time dependent, a balancing of the trilemma results from the empirical and political negotiations of the people of a society. Given uncertainty, he makes the case that the core of any long-range energy strategy is maintenance of the institutional and technical flexibility needed by a globally dynamic energy structure.

Energy professionals must devote more effort to understanding and curtailing the world's energy demand, according to Hans Jørgen Koch. There is no problem on the supply side, but demand is the principal threat to the energy supply-demand balance and the environment. What is needed is an

(continued on page 3)

Contents: President's Message p 1 • Energy: Looking Ahead and Thinking Globally p 4 • Energy Efficiency in a World of Abundant, Cheap Energy p 6 • Excess Refining Capacities in Europe: Impact on the United States and Asia p 10 • Asia-Pacific Energy Security: Lessons from Asian Electricity Reform p 12 • An Evolutionist Analysis of Oil Competition and Oil Competitiveness Throughout Oil History p 18 • The Role of Chief Economist in a Major Oil Company p 22 • The International Petroleum Industry - Its Influence on South African Oil Companies p 24 • Issues Facing the United States Strategic Petroleum Reserve p 26 • UK's Distribution Utilities Not Ready for Competition p 29 • Publications and Calendar p 31.

21ST ANNUAL INTERNATIONAL CONFERENCE OF THE IAEE

Chateau Frontenac, Quebec, Canada, 12-17 May 1998

Theme

Experimenting with Freer Markets: Lessons from the Last 20 Years and Prospects for the Future

The last 20 years have witnessed a relaxation of the institutional constraints that had previously framed the development of energy industries in many areas of the world, especially North America and Europe. This headlong move into freer markets has transformed many of these industries, which are now considered as models for similar initiatives in other sectors and other areas of the world. This conference aims to provide an opportunity to step back from the developments of the last twenty years and assess the consequences of this increased reliance on market forces: What have been important areas of success? Where have the achievements fallen short of expectations? What would we do differently now? The experience acquired during the last few decades can also shed some light on future directions for change: What remains to be done? What role should we aspire regulation to play in the context of freer markets? How do environmental and sustainable development considerations factor into this trend? How relevant is this experience for other energy industries and for other countries and regions of the world? The conference will provide a unique forum where these and related issues will be debated by experts from around the world.

CALL FOR PAPERS

Deadline for Submission of Abstracts: 1 December 1997

Abstracts may be submitted for plenary as well as concurrent sessions. Anyone interested in organizing a session should propose topics, objectives, possible speakers to the Program Chairman well in advance of the deadline for submission of abstracts. Abstracts should be between 300 and 500 words, giving an overview of the topic to be covered. Full details, including the title of the paper, names of the author(s), affiliation(s), address(es), telephone, fax, and e-mail numbers, should also be sent. At least one author from an accepted paper must pay the registration fee and attend the conference to present the paper. All abstracts, session proposals, and related inquiries should be directed to:

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DEADLINES:

Abstract Submission Deadline: 1 December 1997

Notification of Abstract Acceptance: 15 December 1997

Manuscript Submission Deadline: 2 February

President's Message *(continued from page 1)*

Our publications continue to maintain a high standard of excellence and I note that Peter Pearson has initiated a study to look at how information technology will affect our publications and how we might choose to live in the age of electronic communication. We owe a special debt of gratitude to Peter, Campbell Watkins, Len Waverman and Geoff Pearce for their present and future efforts to make our publications better.

The Council meetings in London (January) and San Francisco (September) were very successful in getting through

the business of the IAEE. The agenda included new directions for the Foundation, new organization for officers, and standardization of names for Affiliates. We were able to clear the agenda of Council business for the first time in my memory, which goes back to 1987. In fact, the San Francisco Council meeting cleared a large agenda of items with consensus and without a dissenting vote – the first time in history. This was the result of the leadership of my predecessor, Tony Finizza, and the most dedicated and collegial Council in my memory. We owe them a large debt of thanks and in particular Peter Pearson and Arid Nystad who held the

two toughest jobs – Publications and Conferences – and who both leave Council this year. We expect to see more of them in the future. Our next President, Charles Spierer, will start with a clean deck and a very good Council to take the IAEE on to greater things.

I have recommended that Council meeting minutes be published in the *Newsletter* in some form in order to open up the business of the IAEE and better inform our membership.

We have also increased our contacts with other professional and energy related organizations including the World Energy Council and World Petroleum Congress. In addition, we are working to include the IAEE and its Affiliates in the buildup for the upcoming G7 plus one Energy Ministers' Meeting next March 21-April 1 in Moscow.

On a personal note the last two years have been a transition period for me and some of the most productive professional times of my career. In early 1996, I became Advisor to the Chairman of Caltex after thirteen years as Chief Economist and Manager for Economics for what I consider to be the best energy company in the world. Caltex supported me in my work with the USAEE and the IAEE and provided many good ideas on how to make both organizations better.

In addition to my work with Caltex, I have developed my small consulting firm, petroad, and have served as Executive Director, Pacific Economic Cooperation Council Energy Forum, a twenty-three country member organization which works closely with the APEC Energy Ministers in developing energy business policy initiatives. This has included highly acclaimed business related symposiums for the APEC Ministers in Sydney (1996) and in Edmonton (1997) in cooperation with the Canadian Energy Research Institute. In addition the PECC Energy Forum Conference on energy infrastructure was held in San Francisco just before the North American Conference. Many IAEE members are involved in the PECC Energy Forum and provide an important strategic alliance in a region in which the IAEE needs to develop more Affiliates and membership.

Including my meetings with IAEE Affiliates I will have made over eighty presentations to different organizations in twenty-nine economies on topics related to energy and have published several articles on energy security, energy industry structural change, and deregulation. Much of this has been influenced by my IAEE colleagues and participation in IAEE activities.

In early 1998, I plan to return to the academic world after twenty years in the U. S. Department of Energy and Caltex Petroleum Corporation and continue to work with energy issues relating to the public and private sectors. My mail address is/will be dobpetroad@aol.com.

Finally, I will be around for several more years in my role as a former President to help Charles and Hoesung Lee but I intend to take a very low profile. I particularly appreciate David Williams' continued good work in providing sound administrative management for the IAEE.

Dennis O'Brien

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Editor's Note (continued from page 1)

augmentation of the traditional methods of encouraging energy efficiency with a sectoral strategy which embeds the efficient use of energy in the normal workings of such sectors as construction, manufacturing, transportation and so on.

Jean-Pierre Favennec details petroleum product demand, consumption and refining capacity around the world as well as import and export flows. He explains the reasons for generally low refining margins worldwide and notes that these may be a hindrance to the capital expenditures needed to meet the increasingly strict product standards in Europe and North America. An alternative to this investment may be increased imports but the investment needed to accomplish this may prevent any margin improvement.

Guy Caruso and Xavier Chen, of the IEA, examine general energy security in the Asia-Pacific region in terms of oil, gas and coal. They then discuss in more detail electricity security for the region and some of the lessons learned from experiences before electricity reform and the heightened security that reform has brought about.

J. P. Cueille and E. M. Dos Santos examine the evolution of oil competition since the origin of the industry. Breaking the industry into three main groups, the majors, the independents and the national oil companies, the development of the competitive strategies of each group is noted and how this led to a kind of stability of competition through World War II and up to the first oil shock of 1973. The change in the nature of competition within each group and among groups during and after the 70s and 80s and the competitive instability this implies is then noted.

Peter Davies looks at how the role of the business economist in the petroleum industry has changed over recent years and then details how the role the chief economist plays in one major company. He draws some important conclusions that all energy economists should consider.

In looking at the South African oil industry, Jacques Magliolo first notes that though deregulation in the country is needed it is not being pushed politically. He comments on two state regulations in particular, the Service Station Rationalization Plan and the Petroleum Products Act. Then, noting international oil trends and the impacts these will have on South Africa, he proceeds to build the case for the discontinuance of these regulations. He closes by noting how important a free market will be to ensuring South African and sub-Saharan African oil development.

John Shages looks at the background of the United States Strategic Petroleum Reserve and how it has deviated from original legislative intent. Then he reports on the responses to a series of issues raised in a Federal Register Notice that go to the heart of the Reserve matter. Finally, he comments on three of the issues that will be addressed in the Administration's Statement of Policy on the Reserve.

Twenty three million electricity customers in England and Wales will supposedly have an opportunity to select their electric supplier between April and September 1998, but as Fereidoon Sioshansi points out, things may not happen on schedule and likely at considerably more cost than originally estimated. He notes that as of now, it looks like only two of the thirteen suppliers involved will be able to handle competition come the scheduled April 1998 date and that the costs will be, on average, 90 to 190 percent higher than originally estimated.

DLW

Energy: Looking Ahead and Thinking Globally

By Chauncey Starr*

I am being honored by this opportunity to open your 18th annual meeting today. On a similar occasion in 1980, I opened the 2nd annual IAEE meeting in Cambridge, England, with a talk titled *Energy at the Crossroads: Abundance or Shortage*. The issue then was a perceived limitation on oil resources, which didn't materialize. Today's energy concerns are more inclusive of long-term global issues – social and environmental, as well as economic. We now face several “walls of worry”. Most “walls of worry” are a measure of our inability to clearly foresee global outcomes, rather than being well characterized threats. We usually await observable clarification of such uncertainties, with ample time provided by cautious politicians who choose the “do nothing” option when faced with doubts. Today there is some danger that publicly hyped-up fears, notably of global warming, may overcome such caution. You may recall that in the 1970s such a hype resulted in the United States foreclosing natural gas use for power generation for many years – now our favorite resource. An energy scenario must consider our new “walls of worry”. My view is that technology options should be the primary tools for addressing the physical issues of global energy and environment. These may be less familiar to some of you than econometric and public financing instruments. I will try to shed some light on these technology options from my viewpoint as shaped by several decades of EPRI experience in fashioning energy technologies for national, regional, and individual purposes.

The basis of our global energy projections for the coming century is the burgeoning economic growth of the underdeveloped and developing countries, and the inevitable growth in global energy demand when this is added to more modest growth in the OECD countries. As this audience well knows, energy, and particularly electricity, is a keystone to the operations of modern industrial societies. Developing a global energy scenario requires balancing three prevailing societal trends; economic growth, consumption of energy and resources, and conservation of the environment – called the “trilemma” by our Japanese colleagues.¹

The elements of this trilemma, (in popular terms – population, prosperity, and pollution) are interwoven with economics, culture, and short-term politics.

Unfortunately, the trilemma cannot provide an analytical optimum to direct global energy strategy. The judgments involved are so dependent on social cultures, political agendas, and time horizons, that only a neutral consensus survives (like the “no-regrets” efficiency policy for global warming). As an example of trilemma uncertainty, the balance in India is unpredictable today as its population growth may overtake economic growth. Global population growth certainly challenges all attempts to raise per capita economic welfare and all efforts to minimize the environmental effects of global energy use.

*Chauncey Starr is President Emeritus and Founder, Electric Power Research Institute, Palo Alto, California. This is an edited version of his talk at the 18th Annual North American Conference of the USAEE/IAEE, September 7-10, 1997, San Francisco, California.

See references at end of text.

The interactions between the trilemma components makes their projection difficult and time dependent. They are not independent variables. Demographers have shown that regional economic prosperity – in the short term – increases population by reducing infant and old-age mortality rates; and – in the long term – decreases the fertility rate by reducing the economic value of large families. The empirical finding is that modern industrial societies stabilize at low fertility rates. This has occurred after per capita economic growth rate exceeded population growth and where also traditional culture accepted fertility adjustments. The global demographic uncertainty is how much, when, and where.

And similarly with environmental degradation. On the one hand, industrialization and economic development increases the depletion of natural resources (such as forests, arable land, minerals, clean water, pure air, etc.) and also results in an increased output of waste. On the other hand, economic development also provides the investment for overcoming such degradation by more efficient use of all resources, resulting in reduced resource demand, recycling, pollution controls, etc. Such resource efficiency generally depends on the application of energy, usually by electrification. An example is the use of food refrigeration and freezing in developed countries, as contrasted with underdeveloped regions where large food losses (of up to 50 percent) and endemic gastrointestinal diseases are common. On balance, the empirical evidence is very strong that electrification can provide significant improvements to the quality of life. So the target is not reducing energy consumption but rather to encourage its most productive use.

In each society and in each time period, a balancing of the trilemma results from the empirical and political negotiations of the people of that society. We now are undertaking a novel global negotiation, stimulated by fear of an uncertain future climate change that might be induced by mankind's energy use. This is particularly difficult because unlike most site-specific negotiations, there is not an adequate fact base to provide stakeholders with benefit/cost/risk/time-scale projections of alternative choices. There exists only several future guesstimates modeled from climate, population, and economic simulations, recently reviewed by the World Resources Institute.² As expressed in a comprehensive 1997 paper from the MIT Global Change Program³, the projections from such models depend greatly on “...what is assumed about economic growth, productivity improvement in energy use, and the relative costs of future technologies...”.

If some of the doomsday scenarios for climate change effects actually show up sufficiently to provoke a draconian response, then all projections of global energy futures become irrelevant. The required massive reduction in fossil fuel use would devastate global economies and all practical energy strategies. In comparison, the U.S. proposals for the coming Kyoto conference, as described in newspapers, are quantitatively trivial for global CO₂ emissions, are selectively damaging to the U.S. economy, but also are politically symbolic. Of course, a global effort to use energy efficiently is a clear “no regrets” policy, and perhaps Kyoto may turn to this. More practically, most scenarios of climate effects are spread over many decades. So even if they become evident, most societies given a response option of a cap on economic growth or an adaptation to a shifting climate, would choose the latter. This might mean a geographic movement of

agriculture, industry, and populations, and the increased use of technologic aids and electricity. We have the historical example of air-conditioning revitalizing the U.S. south.

Of course, there remains a reasonable probability that the highly publicized global warming threat may be overblown.⁴ Despite the voiced certainty of the present U.S. administration, recent climatologic findings are suggesting that man-made CO₂ may contribute only fractionally to the globe's natural climate variability. This is a question that only scientific research will resolve. Climate research takes years, and so does any action to ameliorate or adapt. Without a research base, pre-emptive actions may be ineffective and costly. Research on all aspects of this issue should be intensified. However, regardless of the scientific outcome, I believe that societies will choose to adapt to climate change, be it small or large. So our consideration of energy options is still germane.

As viewed by a technologist, we seek a mix of foreseeable technologies that might flexibly respond to future shifts in the trilemma balance. While today's mix may accommodate future technical improvements, it generally takes many decades to alter a technology's comparative commercial status, so that it is possible to roughly project roles and constraints in a projected global mix, assuming continuing trends in growth of population and economics regionally. Such a simplified scenario, based on modest growth rates, was published by Starr and Searl in 1990⁵ and replicated with minor variations by others since, provides us a rough base-case for speculation on the global mix.

As projected in this scenario, by the middle of the coming century, trends alone lead to a global energy demand roughly 4 times the present. Conservation might cut this in half to 2 times present demand by the full application of known technologies to reduce energy consumption per unit of output. This scenario also indicates an electricity demand increase of 7 times present without conservation, and with full efficiency reduced to an increase of 4 times present demand. Most of this will take place in the developing world. Even in the industrial countries, electricity demand will increase. The numbers are less significant than the inevitability of such large demand increases. Global capital investment requirements may become a restraining factor. Only a halt to global economic growth, or an apocalyptic population destruction can moderate such demand increases.

The key message of this scenario is that productive efficiency is the most effective way to reduce global energy demand, and thus the environmental consequences of energy use. Although the capital required for efficiency investment is large (almost the same as supply) past experience suggests that the indirect economic benefits of improved productivity usually makes this a wise economic investment. However, in the short-term, capital for efficiency investment competes with capital for increasing energy supply, particularly in developing countries. It is politically easier to manage the supply side of the system than the demand side.

A second message is that even at best, global energy use is likely to increase in the next half century to at least double today's. With today's fuel mix, this would mean doubling annual CO₂ emissions, even with the full contribution of nonfossil sources to the extent that they are physically and economically usable. As we would expect, the environmental movement has been enthusiastic about renewables such as

solar, wind, biomass, and occasionally hydro, although their disdain for commercial nuclear power can only be considered as disingenuous. Unfortunately, all the renewables face practical barriers. Hydro is obviously limited and has ecological constraints. Biomass involves energy costs of transportation that generally limits its value to about a 25 mile collection radius around the power plant. The intermittency of solar and wind limits their contribution to peaking or intermittent supplements (diurnal availability about 15-30 percent in the temperate zone). Adding energy storage for a continuous base load supply multiplies their capital investment by a rough factor of ten or more, making them economically impractical for such use. Nuclear power is the only non-carbon electricity source that can practically meet the bulk of future global demand.

The inevitability of an increase in annual CO₂ emissions globally is a reality that must be factored into serious discussions of all long-range energy scenarios. Nevertheless, reducing the rate of increase of emissions seems desirable as this extends the time available for adjusting to whatever climate change emissions may induce. For example, a preliminary study by Karl Knapp suggests that an optimistic shift to nonfossil electricity generation and auto transportation might result in buying a few decades delay in mid-century atmospheric CO₂ levels. I will leave with you two policy questions. What level of sacrifice today should be made to obtain such delay of an uncertain threat a half century ahead? What would we do with the added time?

As a personal comment, I have been surprised that the many environmental movements so deeply concerned with the global warming threat have not actively urged international programs to promote energy efficiency in the developing world. These can have immediate effects, utilizing demonstrated technologies. Of course, such programs imply that modern industrialization and economic growth are worthwhile objectives, and they implicitly acknowledge the inevitability of global electrification and growth in electricity demand. This may be ideologically in conflict with the deindustrialization goals of some environmentalists. For example, we have the rather amazing case of Sweden today, recently studied by Nordhaus⁶, where the anti-nuclear Green party is pressuring the state to abandon a low-cost nuclear electricity supply and return to higher cost fossil fuels - with a consequent sacrifice in global warming and economic growth, all against the majority wish of the Swedish public. Fortunately, energy issues are less confused in the developing world where poverty and deprivation are priority environmental targets.

I assume that electricity supply investments will be primarily based on proven technologies, and will be chosen in a framework of available capital (domestic and international), social and political stability, and national security. Cost competition will maintain the dominance of fossil fuels for decades to come, even with environmental constraints, but competition among fossil fuels and with nuclear will be intense. In spite of the past difficulties with the first commercial plants in the United States and elsewhere, nuclear power will have a growing role in countries where long-term capital intensive investments are financially secure and the delivery of oil, coal, and gas is costly. It is not

(continued on page 6)

Energy: Looking Ahead... (continued from page 5)

generally recognized that the new commercial nuclear stations are capital cost competitive with conventional fossil fuel plants, and have the lowest cost fuel with the most secure supply. Only the advanced gas turbine plant is superior to all in gross electricity costs because of its very high conversion efficiency and low capital cost, which overcomes the relatively high cost of natural gas. In China the competition between nuclear power and pipeline gas will be slowly played out. In Japan and Korea, it will be nuclear power vs. imported liquefied natural gas. Clearly, these are country specific situations and very technology dependent.

An effective mix of global and regional strategies requires free access to all technologies. I am concerned that suggested government manipulations of such access by fiscal devices, such as taxation and subsidies, would distort the optimal mix that a free technologic competition could sustain over a long-term. For example, a carbon tax intended to reduce CO₂ emissions would obviously distort the free market mix. It would be a self-inflicted harm if limited to the United States. As a R&D technologist, I view selective taxation or selective subsidies as a subtle form of censorship, and as a meddling R&D hindrance in today's rapidly shifting and relatively free market of technologies. This should not be confused with government funding of pre-competitive science and technology, which I support. As an example, research on enhancing nature's terrestrial and oceanic CO₂ sinks appears promising and contributes to a common knowledge base. Commercial competition is a different playing field, best left unfettered.

In view of all this uncertainty, it appears to me that the core of any long-range energy strategy is maintenance of the institutional and technical flexibility needed by a globally dynamic energy structure. As a corollary, the major industrial governments have a global responsibility to sustain the long-term viability of all energy options and advanced technologies. This is beyond the economic time span of the commercial sector. New and improved technologies provide opportunities to beneficially fashion the future, rather than only to remedy unwelcome events. Obviously this is a technologist's "no regret" policy, so I recommend it enthusiastically.

References:

¹ "TRILEMMA, Three Major Problems Threatening World Survival", Susuma Yoda, Ed., Committee for Research on Global Problems, Central Research Institute of Electric Power Industry, Tokyo, Japan, 1995.

² "The Costs of Climate Protection", Robert Repetto and Duncan Austin, World Resources Institute, 1997.

³ "CO₂ Emissions Limits: Economic Adjustments and the Distribution of Burdens", Henry D. Jacoby, Richard S. Eckaus, A. Denny Ellerman, Ronald G. Prinn, David M. Reiner and Zili Yang. *The Energy Journal*, v.18, n.3, p 31-58, 1997.

⁴ "Greenhouse Forecasting Still Cloudy", Richard A. Kerr, *Science* v.276, p. 1040-42, May 16, 1997.

⁵ "Global Energy and Electricity Futures: Demand and Supply Alternatives", Chauncey Starr and Milton Searl, *Energy Systems and Policy*, v.14, p.53-83, 1990.

⁶ "The Swedish Nuclear Dilemma: Energy and the Environment", William Nordhaus, *Resources for the Future*, 1997.

Energy Efficiency in a World of Abundant, Cheap Energy

By Hans Jørgen Koch*

It is certainly a great honor and pleasure to address you this morning. The message I would like to leave with you is strikingly simple, it is that:

The threat of climate change means that the world, and in particular we energy professionals, must devote much more of our talent and resources to understanding and curtailing the world's burgeoning energy demand.

Some might respond that the energy markets show no evidence of an energy demand problem. I argue that it is precisely this absence of market evidence, this "near silence", that makes the situation dangerous and makes renewed efforts to understand energy demand and to pursue energy efficiency and conservation so necessary. The world's political leadership is coming to recognize the threat of global climate change, and the magnitude of the technical, economic, and political response needed. But thus far, the energy markets have been "quiet" on the issue.

Markets speak through prices and the actions of suppliers and consumers. And frankly, the "quietness" of the energy markets is evident on most, though not all, fronts. In terms of prices, energy markets have been unresponsive. The low energy prices we now enjoy are inhibiting the development, commercialization, and implementation of new energy-efficient technologies. As for energy suppliers, they are only now beginning to really come to terms with the challenge. The declaration by the CEO of BP last May that the greenhouse effect was real and that it merited concerted action was very encouraging. But unfortunately, such attitudes are still rare among energy suppliers. Turning to energy consumers. Here the situation has been mixed. There have been some encouraging actions taken by industrial and commercial consumers, prompted by their recognition of the potential financial and public image liabilities of not making progress soon. Individual consumers, on the other hand, are reacting very little, they are continuing to demand more energy-using goods and services, with only minor regard for the consequences for climate change.

Outside of the energy market, suppliers of some types of appliances and equipment have made impressive improvements in the energy efficiency of their products. This has not, however, been prompted by signals from the energy market. It has been the result of government persuasion and regulation and, as with industrial and commercial enterprises as energy consumers, the recognition of the potential liabilities of inaction.

The relative "quietness" of the markets makes political action all that much more necessary and all that much more difficult. Of course, you recognize the situation as one of an "externality". Well, this is an externality that cannot be ignored. It must be conquered - first by internalizing as much of it as possible through prices, and second by other policy

* Hans Jørgen Koch is Director, Energy Efficiency, Technology and R & D, International Energy Agency, Paris, France. This is an edited version of his talk at the 18th Annual North American Conference of the USAEE/IAEE, September 7-10, 1997, San Francisco, California.

measures such as regulation. Both means will require a great amount of political courage and work – based on solid understanding of the technical, economic, and behavioral aspects of energy demand.

Focus on Energy Demand

Thanks to the efforts of the energy industry, and in no small part the brokering work of the IEA, I believe we are not facing a global supply problem.

There are certainly challenges in local supply problems and in energy sector regulatory reform. But there are no strong global resource constraints – there is enough coal for 200 years, and gas for 70 years and oil for 50 years, if not longer. Turning to prices. The era of high-priced oil and panic are over. We find prices lower in real terms than before 1973.

This leaves the demand side. I believe, it is demand that is the principal threat to the energy supply-demand balance and to the environment at the moment. We have strong environmental constraints on energy demand. And in the longer term, the comfortable supply-demand balance might change in Asia, if China and India grow as expected.

I can assure you that we in the IEA will be vigilant in our efforts on energy supply issues. But I believe that we – the IEA, the community of energy professionals, and the world at large – must focus much more on energy use and energy users, at a level of detail sufficient to:

- See how energy is really used, and where our problems might arise in the future,
- Understand better how to effectively influence energy use with public policy, and
- Discuss and negotiate responsibilities for addressing the climate change problem. We all recognize that we have responsibilities and that sooner, rather than later, we are going to have to accept and act on them.

The need to understand energy demand, and energy efficiency, has never been greater. Energy use is the principal threat to energy market stability and environmental sustainability, and, therefore, it should be the main concern of policymakers.

Energy Efficiency a Concern of the Present and Future

At the moment, energy efficiency is not improving as rapidly as growth in levels of GDP per capita, population, and various energy services – floor area heated, distances traveled, etc. So, not surprisingly, energy consumption is rising. This growth in consumption, coupled with the continued reliance on fossil fuels, makes cutting CO₂ emissions extremely difficult.

There are several major ways to mitigate emissions of CO₂ and greenhouse gases – energy efficiency is one way, switching away from CO₂-intensive fuels another, and CO₂ sequestration another. However, only energy efficiency and fuel switching can give results in the near term. The timeframe for development, commercialization, and implementation of viable CO₂ capture and disposal methods is considerably longer.

Brief Review of IEA Trends in Energy Use

Energy/GDP ratios are widely recognized as overly simplistic, misleading, and insufficient to describe how energy is used or how well energy is used. Lifestyle changes

and structural changes within the productive economy have opposing effects, with lifestyles became more energy intensive, thus raising energy demand, while structural changes (both within manufacturing in a few countries and between sectors in others) restrained demand growth, all relative to GDP.

Energy savings in IEA countries were significant between 1973 and 1993. Approximately 20 percent reduction in energy intensities occurred in some IEA countries (United States, West Germany, Japan, Denmark). The most important savings were in air travel (55 percent less fuel per passenger-km flown), manufacturing (25-35 percent less energy use per unit of activity), space heating (25-50 percent less heat per square meter of home or building area), the main spark was higher fuel prices and long term technological changes, with some help from energy efficiency programs where they were applied, such as thermal protection requirement on new homes. Savings were somewhat less in countries where alternative supplies exist (cheap electricity, etc.) or in sectors where high user-taxes blunted the impacts of higher crude prices. The real reduction in fuel use per kilometer for cars in Europe was less than 10 percent, for example, although more is now being promised by major manufacturers in Germany, France, Sweden, and Italy.

Improvements in efficiency are clearly slowing down, but still restraining demand relative to GDP. In some markets, such as cars, the real fuel economy is stagnant, and there is some evidence of a slight reversal in manufacturing, but in other markets (heating, home appliances), efficiency continues to improve. Most of the 1973-1990 savings have persisted. There were only small rebounds in energy use from greater efficiency after oil prices fell. And there was little unexpected growth in car use or heating.

At the end of the day, IEA energy demand is considerably lower than it would have been had individuals and companies not discovered and implemented more efficient ways of using energy. Few doubt that as equipment turns over another 20-33 percent reduction will occur. The reason is that new aircraft, homes, appliances, and industrial equipment uses much less energy than what is being replaced. But this was also true in 1973, and that “gap” then increased when fuel prices rose! In other words, we keep discovering new ways to save energy, just as we never seem to run out of reserves of oil and gas. What is uncertain is the time it takes for each step of improvement to occur, and what the real net reduction will be.

One important result of the last twenty years is the overall shift in the structure of energy use, towards services and final consumers (passenger transport, households) and away from industry.

The past notwithstanding, the challenge today is that the combined impacts of slow improvements in efficiency and shifts to lower carbon fuels is not reducing emissions as rapidly as economic growth is raising emissions.

How Can Governments Encourage Improving Energy Efficiency?

The policy impasse over what to do about CO₂ emissions is real. We can see its effects on the upcoming Kyoto negotiations as countries and industries step up their propaganda for or against action. At the same time there are a

(continued on page 8)

Energy Efficiency... (continued from page 7)

number of ways that can be used to further the exploitation of the energy efficiency potential. The most potent methods involve pricing, particularly eliminating subsidies and trying to include externalities (such as CO₂) in prices as well. Efficiency standards, where implemented, have had a proven economic effect on improvements in home heating and equipment. Voluntary agreements seem to spur both technological progress and the take-up of efficiency improvements. Some of these strategies do not need to wait for broad agreement on the "right" carbon tax or other long-range strategies.

There are other policies, too, which we cannot ignore:

- Speeding up technological progress by makers of key-energy using capital – R/D and energy price signals;
- Improving markets for energy-saving capital through information, demonstration, testing;
- Speeding up capital stock turnover where justified: scrapping some old appliances and vehicles (aircraft, trucks, some cars, as has been tried for reasons of air pollution); and
- Recognizing and addressing true market failures and barriers (as opposed to sluggish markets, weak consumer interest caused by stable or low energy prices). We think that household appliances and insulation levels and automobile technology would be sub-optimal without some prodding from authorities.

We recognize that today, energy efficiency is not interesting, not selling itself today at the maximum "cost effective" rate. Consumers and industries have other things on their minds. Consumers have, by and large, accepted the present levels of expenditures for energy and are happy with the present slow pace of improvements, however they might measure these improvements. Since energy pricing and price expectations do play a role in the offering of efficiency technology by manufacturers and its take-up by all energy-consumers, it seems that even modest price increases justified by CO₂ and other externalities may have a surprising effect. Fortunately, some nations – the Nordic Countries, the U.K., and Holland – have moved towards this internalization, for a variety of purposes, and announced their intention to keep some of new the taxes at least constant in real terms.

This prescription acknowledges the importance of market forces in stimulating the rate of efficiency improvements. Nevertheless, as suggested earlier, certain interventions by authorities are still justified: efficiency standards on new homes and some equipment, because individual consumers cannot make complex cost benefit or technology calculations, and they do not have the market power of large companies that make equipment. At the same time, we recognize that some interventions are labor intensive (large scale programs, subsidies, etc.) and have been of mixed value. Some succeeded, some did not. It is time to call the winners "winners" and build on them, and jettison the losers. In this regard the United States has undertaken the most elaborate research to evaluate the real impacts of various energy efficiency strategies (and technologies themselves); we call on other IEA members to improve their own efforts at evaluation, to be able to know soon whether the present proposals to restrain CO₂ emissions through improving efficiency are effective.

Need for a New Paradigm: a Sectoral Strategy

Though these traditional methods of encouraging efficiency still offer great potential, I believe we must augment these efforts through sectoral policies. In other words, we should address building and appliance energy use in the context of housing policy, industrial energy use through competitiveness and environmental policy, automobile efficiency and trucking through transport policies, and so forth. The reason is clear: for all but a few activities, energy is a minor input to overall activity.

The sectoral strategy for energy efficiency works in a natural way. The key step is to embed efficient use of energy in normal workings of sectors: this reduces costs of efficiency per se. Otherwise the costs of just "making energy use more efficient" rise because efficiency investments are seen in a vacuum without other reasons to disturb a building, a factory, or a vehicle. Taking a wing of a building or an entire factory out of use to tune up energy-systems hardly seems justified. Improving energy use when major process or structural overhaul is imminent makes much more sense and costs less. (This is particularly important in Eastern Europe, where most of the building stock will have to undergo expensive renovation sooner or later, at which time making efficiency improvements will cost very little.) Use collective sectoral resources to improve expertise among the experts. California, for example, provided a great deal of guidance to home builders, architects, and engineers so they could follow the relatively stringent requirements for new housing.

Certainly there will be differences of opinion over what is "optimal". An open policy process helps to narrow these differences. But the major bearers of technology are the manufacturers and they must be included in this process.

For industry, voluntary agreements, to the extent that they push technology in a cost-effective way (rather than simply validating existing trends) create a useful framework for experts in industry to solve problems to accelerate efficiency improvements and reduce CO₂ emissions. We have to be careful, however, to not expect too much from the voluntary agreements as some energy savings and CO₂ reductions may have been obtained anyway.

For cars, automobile companies in Europe and Japan have become very aggressive at reducing fuel consumption/kilometer in new cars even as the average car becomes more powerful and better equipped. In freight, trucks and trucking are also sensitive to many other larger costs besides those of fuels, and trucking is still rigidly regulated in many countries. Policy reforms in Germany and other European countries may lead to some restraint in fuel use by trucks without impeding the economic flow of materials in the economy, certainly a good example of a how a sectoral policy not even connected to energy could nevertheless reduce energy needs.

Energy authorities are still crucial to link efforts across sectors, join efforts to environmental policy, and to balance overall supply/demand concerns. There is a big role for energy economists, too. No one would argue that all the basic or applied energy economics problems have been solved. Like climate models, economic models have big holes too! But whereas the price of oil was on everyone's mind when the IAEE became active, it has very much faded from the headlines. In that sense, energy economists are themselves less in demand than a decade ago, and planning and analysis in both government and the energy industry has been cut back

drastically. Yet there remains an enormous task. More needs to be done, and my organization, the IEA, expects to play a major role in that process. I suggest that the IAEE do likewise.

Conclusions

This past June at the United Nations in New York, world leaders met and discussed their progress on climate change issues. I don't think it is mischaracterizing the situation to say that the heads of state of the major developed economies were "embarrassed" to have to admit that they would not attain the greenhouse gas emissions goals they had set for themselves in Rio de Janeiro. They will no doubt be "embarrassed" further, if - as many observers fear - the COP HI meeting in Kyoto fails to reach agreement on goals for the early decades of the next century. This would indeed be disappointing given the no-regrets potential for energy efficiency that exists in OECD countries. There is a potential no-regrets savings of perhaps 20-30 percent. Unfortunately, there are no "silver bullet" technologies or policies that can yield all of these savings. The potential is spread throughout our economies, and must be pursued on many fronts. Nonetheless, it is obvious that some of the largest potential savings exist in personal transport, electricity generation, industrial motor systems, building lighting.

To my mind, energy efficiency is a resource every bit as valuable as oil, gas, and coal. And I believe we must pursue this potential with all the tenacity with which we exploit other energy resources. For this to happen, we energy professionals must do our part. We must develop and communicate effectively a solid understanding of the technical, economic, and behavioral aspects of energy demand and the role of energy efficiency.

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BIEE/UNIVERSITY OF WARWICK CONFERENCE

THE INTERNATIONAL ENERGY EXPERIENCE: MARKETS, REGULATION AND ENVIRONMENT

8-9 December 1997, University of Warwick, Coventry, UK

This academic energy conference, convened by the British Institute of Energy Economics (BIEE), and by the Centre for Management under Regulation (directed by Catherine Waddams) and the Department of Economics at University of Warwick, follows the December 1995 conference on *The UK Energy Experience: A Model or a Warning?* This second conference will provide a unique opportunity to review UK and international energy experience in the light of recent progress in energy, environmental and regulatory economics. The conference will bring together, from the UK and elsewhere, university economists and others with specializations in energy issues, postgraduate students and also economists and policy makers working on energy issues in industry, government and related organizations. John Battle, UK Minister for Science, Energy and Industry, has agreed to address the conference as opening speaker.

Other speakers confirmed include: Professor David Newbery, University of Cambridge; Professor Peter Davies, Chief Economist BP; Professor Colin Robinson, University of Surrey and Institute of Economic Affairs; Professor Luigi da Paoli, Milan; Professor Catherine Waddams, University of Warwick; Professor Alex Kemp, University of Aberdeen. Peter Oppenheimer, Christchurch, Oxford and will address the conference dinner, which will be presided over by Lord Nigel Lawson of Braby, President of the BIEE.

CONFERENCE ORGANIZATION AND PROCEEDINGS

Nearly 50 abstracts have been accepted and over 50 papers will be delivered, the majority of which will be published in the conference proceedings (subject to receipt by the end of October).

It is anticipated that, as with *The UK Energy Experience: A Model or a Warning?* (edited by Gordon MacKerron and Peter Pearson, and published in March 1996 by Imperial College Press), papers presented at the conference will 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 8 December, meals, VAT and conference proceedings: £80 (academic participants, paper presenters and BIEE members), £150 (nonacademics). It is intended to offer reduced rates for postgraduate students.

Registration: Monday 8 December from 10.00 hrs.; conference starts 11.30 hrs. Monday 8 December; conference ends approximately 16.00 hrs. on 9 December.

FURTHER INFORMATION

Please address any inquiries and send abstracts to Mary Scanlan, Administrative Office, BIEE, 37 Woodville Gardens, Ealing, London W5 2LL. Tel: +44-(0)181-997-3707; fax: +44-(0)181-566-7674.

**IA
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Excess Refining Capacities in Europe: Impact on the United States and Asia

By Jean-Pierre Favennec*

Oil Products Demand in the World

Demand by Region

Global demand for petroleum products is increasing at some 1 to 2 percent per annum. Excluding the former Soviet Union, where consumption collapsed from 8 million bbls/day in 1987 to less than 4 in 1996, growth is of the order of 3 to 4 percent per annum.

Asia is the area where growth is the highest, over 5 percent per annum. Other areas of significant growth are Latin America, the Middle East and Africa. On the other hand, in the two largest markets, North America and Europe, growth in demand has been relatively slow (See Table 1).

Table 1
Product Consumption
million tonnes

| | 1988 | 1996 | 96/88 |
|---------------|--------|--------|--------|
| Asia | 583.3 | 885.4 | +51.8% |
| Middle East | 150.5 | 190.5 | +26.6 |
| Africa | 88.1 | 110.3 | +25.2 |
| Latin America | 227.1 | 277.5 | +22.2 |
| Europe | 700.1 | 740.1 | +5.7 |
| North America | 873.5 | 912.5 | +4.5 |
| FSU | 414.6 | 196.5 | -52.7 |
| Total | 3037.2 | 3312.8 | +9.1 |

Demand by Product

Three products, motor gasoline, gas oil (automotive and heating) and heavy fuel oil, account for two thirds of total products consumption. If one excepts the IEA classification of gas (i.e. LNG, LPG and ethane, not really a group of petroleum products) consumption of jet kerosene has shown the highest growth, although demand for motor spirit and automotive gas oil has also increased strongly. In contrast, use of heavy fuel oil has fallen over the last 25 years (See Table 2). (Note: gas oil demand data are not generally broken down between automotive and heating use. However, heating gas oil use is largely limited to Europe – some 100 million tons per annum – and United States – about 40 million tons per annum – so world consumption of automotive gas oil is of the order of 650 to 680 million tons per annum.)

Refining Worldwide

Refining Capacities

The refining industry converts crude oil into fuels which provide 40 percent of global energy requirements. The industry developed considerably in the 1960s and 1970s. Refining capacity peaked at 4.1 billion tons in 1980 before dropping to 3.6 tons in 1986 following the two oil crises. It subsequently increased slightly between 1987 and 1996. At the end of 1996, refining (atmospheric distillation) capacity worldwide stood at 3.8 billion tons per year.

*Jean-Pierre Favennec is Deputy Director, Center For Economics and Management, IFP and IFP School, Paris, France. This is an edited version of his talk at the 18th Annual North American Conference of the USAEE/IAEE, September 7-10, 1997, San Francisco, California.

Table 2
Consumption By Product
million tonnes

| | 1973 | 1994 | 94/73 |
|----------------|--------|--------|-------|
| Gas | 100.5 | 180.9 | +80% |
| Aviation Fuels | 115.8 | 174.4 | +51 |
| Gas Oil | 592.8 | 819.3 | +38 |
| Motor Gasoline | 559.0 | 760.1 | +36 |
| Naphtha | 100.7 | 135.1 | +35 |
| Other Products | 193.4 | 257.2 | +33 |
| Refinery Fuel | 146.1 | 171.9 | +18 |
| Kerosine | 75.2 | 80.2 | +7 |
| Bunkers | 134.9 | 135.0 | 0 |
| Residual Fuel | 748.5 | 483.8 | -35 |
| Total | 2766.9 | 3197.9 | 16 |

Source: IEA

Refining capacity reflects the demand for petroleum products. It was the strong increase in demand that caused the sharp rise in capacity up to 1980; between 1950 and 1980 capacity doubled every ten years. It was the fall in petroleum product consumption following the rise in crude prices in the 1970s that led to refinery shutdowns and to reductions in distillation capacity.

Refining capacity is concentrated in North America (23 percent of world capacity), in Europe (22 percent), in the former Soviet Union (14 percent) and in Asia (21 percent). Capacity is growing rapidly in the latter region; 50 percent of ongoing construction is concentrated there. The strong economic growth of the newly industrialized countries, which are often lacking in energy resources, results in considerable demand for petroleum products. Substantial growth in capacity can also be seen in the OPEC countries, particularly in the Middle East where demand is stimulated by very low product prices.

World Refining Capacities Versus Products Consumption

Only two regions have a deficit in refining capacity: North America and Asia. Because of the collapse of oil products (and overall energy) demand, the FSU has substantial excess capacity. Latin America and the Middle East are the largest product exporters (See Table 3).

Table 3
Product Consumption vs. Refining Capacities
million tonnes - 1996

| | Refining Capacity | Product Consumption | Prod. Cons/ Ref. Cap. |
|---------------|-------------------|---------------------|-----------------------|
| Asia | 814.3 | 885.4 | 109% |
| North America | 864.2 | 912.5 | 105 |
| Europe | 820.2 | 740.1 | 90 |
| Africa | 145.3 | 110.3 | 76 |
| Latin America | 372.6 | 277.5 | 74 |
| Middle East | 269.8 | 190.5 | 71 |
| FSU | 517.0 | 196.5 | 38 |
| Total | 3803.4 | 3312.8 | 114.8 |

Source: *Oil and Gas Journal* and *BP Statistical Review*

In Western Europe refining capacities are 707 Mt/y and products consumption around 670 mt/y. Because of the importance of exchanges with other regions, excess capacities are estimated around 1 Mbd (50 mt/y).

Margins

Excess capacities in Europe (both in Western Europe and in the FSU) have made for low refining margins over recent

years. After having leveled off at about \$2/bbl in early 1990, a complex European refinery's margins were around \$1.5/bbl up to mid-1996 while full costs (catalysts, chemicals, personnel, maintenance, overheads, depreciation and return on investment) are in the range of \$3/bbl.

Since it is relatively easy to transport products from one region to another one, poor margins have spread out in other areas. In the Gulf of Mexico, for several years now, margins for a complex refinery (of the FCC type) have been fairly low, ranging from \$0 to \$2/bbl (for West Texas Intermediate, the American benchmark crude). In this region, which is wide open to imports, margins are affected by products arriving from abroad, particularly from Europe. In contrast, margins are higher in the midwest (around \$1.7/bbl) and in California (around \$3/bbl for several years).

The situation in Asia is better. Refining margins have been around \$3-4/bbl on average for the last few years. Margins in this part of the world are currently stronger than elsewhere because of continued growth in demand and because there are some protected markets on which prices bring in a profit. Nevertheless, temporary local factors, particularly the negative supply/demand balance in China, Indonesia, India and Vietnam, strongly affect these margins.

Overcapacity in Europe

A refinery can actually operate much more than 95 percent of the time and the stream factor is at best around 90 percent. So low margins clearly result from low stream factors, and although the latter have improved since the beginning of the eighties they are not yet satisfactory.

However, the scheduled shutdown of atmospheric distillation capacity does not exceed a few thousand barrels per day (or million tonnes per year); there are several obstacles that prevent margins from improving.

The internationalization of trade. Even an effective reduction in European capacity would probably only slightly improve margins because the free circulation of products throughout the world tends to restrict and to balance the prices of different products, and therefore of margins. Moreover, the notion of constraint in relation to margins is clearly illustrated by the use of the term window.

Abundance of light crudes. The difference in price between medium and light crudes is decreasing. A number of accumulations of low density crudes have been discovered during the last ten years and this has increased the proportion of light crude in overall production. This has tended to distort the situation. Refineries, particularly European refineries with conventional conversion facilities, find themselves with a crude supply that is no longer suited to their facilities which are designed to process medium to heavy crudes. Hence, until recently, the price of gasoline was relatively low and that of fuel oil fairly high, with a crack spread that did not help the profitability of cracking units.

Consequently, in view of the abundant supply of light crudes, the situation is currently economically more favorable for small hydroskimming refineries that might otherwise have had to be shut down. Hence the limited number of closures of this type or refinery. However the decision to close a refinery with conversion facilities is more difficult to take because of the size of the investment involved. In addition, since these refineries are more sophisticated they are better equipped to handle a reversal of the situation.

The cost of closing a refinery is very high – around \$100 million, or more because of the cost of site rehabilitation. This is a decisive criterion, because even if margins are relatively low it is still often preferable to continue to operate the refinery. What company would be prepared to close a refinery and bear the cost on its own for the sake of the European refining industry when its competitors would gain by an increase in margins?

Products Imports and Exports

For both strategic and economic reasons refineries have generally been built in consumer regions, within easy reach of markets. However, in the 1970s, the oil producing countries made significant investments in what are known as "source refineries" for export purposes, and so a tendency developed for the large crude oil production areas also to export products. These exports have never accounted for a very large share of the consumption of industrialized countries but they play an important part in the world petroleum balance.

Table 4
Product Imports and Exports
million tonnes - 1995

| | Imports | Exports | Net Imports |
|---------------|---------|---------|-------------|
| North America | 98.8 | 59.8 | 39.0 |
| Latin America | 24.1 | 50.7 | -26.6 |
| Europe | 83.1 | 36.2 | 46.9 |
| FSU | 12.6 | 55.9 | -43.3 |
| Middle East | 3.7 | 111.0 | -107.3 |
| Africa | 15.7 | 34.4 | -18.7 |
| Asia | 169.5 | 63.8 | 105.7 |

Source: *BP Statistical Review*

Three regions export significant quantities of products:

- The Middle East and especially the Arabian/Persian Gulf countries (mainly Saudi Arabia and Kuwait) which export large amounts of products to Asia. This is a key element in the oil industry since, as can be seen from Table 4, Asian imports are equivalent to Middle East exports.
- Latin America, and especially Venezuela, which is an important source of gasoline for the United States.
- The FSU which exports fair amounts of naphtha, diesel oil and residual fuel oil to Western Europe.

The situation of Western Europe is unique since, despite overcapacities, this region imports large quantities of products from the FSU, but has to export fair amounts of gasoline.

Analysis of European Product Imports and Exports

Margins are low in Europe, mainly because of overcapacities, but also because of the mismatch between refining structure and product demand. The consumption of diesel oil for transport purposes is very high and exceeds production, while excess gasoline and fuel oil are exported.

Product Flows Between the FSU and Western Europe

Western Europe imports about 10 million tonnes of gas/diesel oil from the FSU every year. Oil products demand collapsed in this region, especially in Russia (from 250 million tonnes in 1990 to 130 million tonnes in 1996), because of the economic crisis. Of course, oil production decreased also, but at a slightly lower pace. Consequently, there are now huge excess capacities.

(continued on page 12)

Excess Refining Capacities...*(continued from page 11)*

Exports of crude oil and products have remained one of the main sources of hard currency for the FSU which exports about 1 million barrels per day of crude oil and a slightly lower quantity of products. But since FSU refineries are on average rather old and poorly equipped with conversion (cracking) facilities, they produce mainly straight run products, i.e., naphtha, gas oil and reduced crude for export.

Western Europe is long in gasoline but short in naphtha, and the FSU, together with North Africa, are the main source of this product. All the same, Western Europe imports large quantities of gas oil. Because of its rather high sulfur content, Russian gas oil cannot be used as a motor fuel in Western Europe and is mainly sold as heating oil. Europe also imports atmospheric residue from the FSU, and this is used in vacuum distillation units and catalytic crackers to make light products.

Product Flows Between Europe and the United States

On the other hand, Europe is now a gasoline exporter, a significant change compared to the situation in the 1980s when this region imported gasoline. This can be explained by two factors:

- increased dieselization of the private car population has reduced the demand for gasoline over the last few years, and
- the production of unleaded gasoline has required the construction of new process units (isomerization, alkylation) and has increased gasoline production.

A rather large share of this excess gasoline is exported to the United States. This outlet is of key importance to the European refiners.

The other large supplier of gasoline to North America (United States) is Venezuela, and imports from the Caribbean area have for many years made up the balance. However, over the last 20 years, imports from the Virgin Islands and Trinidad and Tobago, have been drastically reduced and imports from Venezuela have developed.

Venezuela is one of the few OPEC countries (along with Saudi Arabia and Kuwait) to have a strategy for the development of refining both locally and abroad. PDVSA owns large refineries in the United States but has also developed some very large and very sophisticated plants in Venezuela - Amuay, Cardon etc. - which are among the largest refineries in the world.

Gasoline imports are low during winter and usually peak at the beginning of spring. Gasoline prices follow a similar trend. Of course, one reason for the differential between the gasoline (FOB) price in Europe and the gasoline (CIF) price in the United States is the cost of transportation between Europe and New York, and the differential must be high enough to make it worthwhile.

Investments to Meet Environmental Constraints and How to Finance Them

Substantial capital expenditure is required in North America and in Europe in order to meet increasingly strict product standards. But margins are low in many, if not all, areas and make financing questionable.

In Europe, importing products from the FSU is a very convenient and rather cheap alternative to the construction of

(continued on page 17)

Asia-Pacific Energy Security: Lessons from Asian Electricity Reform

*By Guy F. Caruso and Xavier Chen**

Energy security is widely understood as one of the key issues of the Asia-Pacific region. Indeed, over the past two decades, strong economic growth, growing population and urbanization, increased income levels, implementation of the programs of industrialization and poverty reduction in the developing countries of the Asia-Pacific region have generated strong demand for commercial energy in this region. The total primary energy demand more than tripled between 1973 and 1993 and is expected to more than double between now and 2010. Ensuring the availability of an adequate energy supply at reasonable costs is vital for the region's future growth. It is also a vital issue worldwide as the energy markets, especially the oil market, are globalized.

In this paper, we would like to discuss the issue of energy security for the Asia-Pacific in light of the experiences of Asian electricity reform that we have learned from our recently published *Asia Electricity Study*¹.

Why are the experiences of Asian electricity reform relevant to the energy security of the Asia-Pacific region?

- First of all, electricity supply security is one of the important aspects of energy security. It is so not only because electricity as a form of energy is being increasingly utilized in modern societies, it is also because as the centerpiece of the energy system, the development of the electricity sector has profound impacts on the whole energy system.
- Secondly, the loss of electricity supply (either blackout or brownout), which is a serious loss of energy security, produced severe adverse impacts on the social and economic life in a large number of Asian developing countries in the 1980s and early 1990s. The ways by which many of these countries have solved or eased the electricity supply shortage problems would provide some useful lessons on how these countries can also solve the problems related to oil shortage, coal insufficiency and lack of gas infrastructures.

Of course, there are important differences between the electricity supply industry and other energy industries. Electricity is derived from other sources of energy and its supply security will ultimately depend on that of other energy sources. There are also important geo-politically related external aspects of oil supply security, which is much less significant in the electricity sector. However, energy security of a country is not just a matter of external supply. Reduced reliance on external supplies is very important, but not the whole answer. Internal factors such as regulatory framework, investment regime, pricing and taxation policy, and demand management are also highly relevant. It is on these internal factors of a country's energy security that some

* Guy F. Caruso and Xavier Chen are with the Office of Non-Member Countries, International Energy Agency, Paris France. This is an edited version of a paper presented at the 18th annual North American Conference of the USAEE/IAEE, San Francisco, CA, USA, September 7-10, 1997.

¹ See footnote at end of text.

lessons could be derived from the experiences of Asian electricity reform.

Let's first discuss the issue of energy security for the Asia-Pacific region. We define energy security as access to sufficient supplies of energy at reasonable costs.

Energy Security of the Asia-Pacific Region

According to the IEA *1996 World Energy Outlook*, in a business-as-usual scenario, the world's total primary energy demand is to grow by 46 percent between 1993 and 2010. Non-OECD countries will account for 75 percent of the forecast increase in energy demand in the year 2010, and a similar proportion of the increase in CO₂ emissions. The most dramatic increase in energy use is likely to occur in the Asia-Pacific region, where Asian developing countries will account for 55 percent of the world's total increase in energy demand. Asian developing countries will also account for 44 percent of the incremental demand for oil, 92 percent of incremental demand for coal, and 52 percent of incremental demand for electricity. These countries will be responsible for nearly 50 percent of the total increase in CO₂ emissions. The shares of these countries in the world economy and energy market will also continue to increase, as shown in Table 1.

Table 1
Asian Developing Countries in World Energy (Percent)

| | 1973 | 1993 | 2010 |
|---------------------------|------|------|------|
| GDP in PPP Terms | 13 | 23 | 36 |
| Population | 62 | 63 | 63 |
| Primary Energy Demand | 8 | 18 | 26 |
| Solids | 17 | 34 | 47 |
| Oil | 6 | 16 | 23 |
| Gas | 1 | 6 | 11 |
| Nuclear | 1 | 6 | 11 |
| Hydro/Others | 6 | 15 | 23 |
| CO ₂ Emissions | 10 | 22 | 31 |
| Net Oil Import Dependency | 12 | 34 | 66 |

Source: *World Energy Outlook*, IEA/OECD, Paris, 1996.

Oil Security

The key questions about oil security would include: 1) whether the growing oil demand of Asia-Pacific countries can be met by supplies either within the countries, within the Asia-Pacific region or from outside of the region; and 2) whether these countries have the necessary capacity to cope with possible external supply disruptions in such a way that their economy and people will not be too seriously affected.

Including Japan, oil demand in Asia has grown by 30 percent since 1990 and is expected to grow from 17 mb/d in 1995 to 28-38 mb/d in 2010. Corresponding oil production growth is expected to be much lower ranging from 7-8 mb/d, leading to net imports growing from 58 percent to 65-79 percent in 2010. The bulk of the Asian oil imports are likely to come from the Middle East. At the same time, OECD oil import dependence is also expected to increase significantly. Currently, the OECD as a whole relies on imports to meet around one half of its total oil demand. It is expected that this ratio will not change significantly by 2000 and could increase considerably over the following decade, reaching about 60 percent by 2010.

The oil security issue becomes increasingly urgent in Asia as traditional oil importers (Japan, Korea, India, Chi-

nese Taipei, Philippines and Thailand) continue to rely heavily on external sources, and traditional oil exporters (China and Indonesia) have become or are becoming oil importers: China which became a net oil importer in 1993 would increase its volume of imports to 50 mt in 2000 and close to 100 mt by 2010; and Indonesia may become a net oil importer by the turn of the century.

Another important source of oil insecurity is the lack of sufficient emergency oil stocks in many large importing countries: China does not yet have any strategic oil stockpile as the country became a net oil importer only recently; India, a traditional large importer that suffered seriously from previous oil crises, still does not have emergency stocks. Other oil importing countries/economies (Korea, Chinese Taipei, Philippines and Thailand) do have limited oil stockpiles but with levels much below the IEA's minimum standard of 90 days of net imports.

Coal Security

The Asia-Pacific region has important coal reserves. China, India and Australia are important coal producers and will continue to be so in the coming decades. However, if not properly managed, coal supply security may well become an issue. The UK, for example, despite having extensive coal reserves, experienced a simultaneous loss of domestic coal supply in 1984, because of strike action in the UK mines.

In both China and India, coal will be the dominant energy source. The high cost related to the long-distance transportation and the saturation of railway capacity have been and will continue to be the constraining factors for coal supply security. Huge investments will also be needed in both countries for the expansion of coal production capacity. According to the Indian government's forecast, total coal demand in India will rise from 283 mt in 1995 to 716 mt in 2007, against the total production capacity of 594 mt in 2007. The coal demand-supply gap in India will require 122 mt of imports in 2007.

Gas Security

There are two major risk categories related to the security of natural gas:

- Long-term risk that new supplies cannot be brought onstream to meet growing demand for either economic or political reasons;
- Risk of disruption to existing supplies such as political disruptions, accidents or extreme weather conditions.

In the gas sector, Asia is different from Europe and North America in many aspects. First, the share of gas in the total primary energy supply (TPES) in Asia is much lower. For example, gas accounts for only 1.5 percent of the TPES in China and 6.6 percent in India. Second, gas transportation and distribution systems are not well developed in Asia. The only international gas pipeline in the region is the one running from Malaysia to Singapore. Third, the Asian gas markets currently do not favor buyers, as the demand is growing strongly in many countries but the available regional supply sources are still limited or to be developed, and many new sources are located at a considerable distance from consuming centers.

Of all forms of energy in Asia, natural gas has the strongest growth prospects. Infrastructure, both for import/

(continued on page 14)

Asia-Pacific Energy Security (continued from page 13)

export and for domestic consumption of gas, will need to expand significantly. According to our *Asia Gas Study* published last year, growing gas demand in Asia and the limited gas availability within the region could lead the region to import up to 40 percent of internationally traded gas supplies from outside the region by 2010. Asian demand for liquefied natural gas (LNG) is expected to more than double between 1994 and 2010. A huge amount of investment in gas infrastructure will be required – some US\$20 billion for the ASEAN countries alone. Thus, the main gas security concern will be around the question of how to meet the growing regional gas requirement.

There are numerous potential gas projects both within the Asia-Pacific region and between the Asia-Pacific and its surrounding regions, namely Russia's Far East (Siberia), the Central Asia and the Middle East. While projects of many intra-regional and inter-regional gas pipelines are still on the drawing boards, many countries in Asia plan to increase the import volume of LNG (Japan, Korea, Chinese Taipei) or are planning to start importing LNG (China, India, Thailand and the Philippines). These projects will not only need huge investments but also strong political willingness for co-operation among all countries involved.

Electricity Security

The IEA distinguishes three aspects of security of electricity supply:

1. Short-term security, i.e., system reliability;
2. Long-term security, i.e., sufficient capacity investment; and
3. Security of fuel supply, especially diversity of fuel supply.

System reliability essentially refers to the short-term capability of the power system to cover demand at all times. This needs a sufficient long-term capacity investment and a well interconnected and robust transmission and distribution network. Security of fuel supply is self-explanatory for a power plant. Diversity of supply sources refers mainly to a power system rather than to an individual plant, although a multi-fuel fired plant may better ensure its fuel supply security. For developing countries of the Asia-Pacific, electricity supply security generally means overcoming the short-term and long-term supply capacity shortages.

Table 2
Annual Growth Rates of GDP and Electricity Consumption in Asian Countries (1980-1992)

| Country | GDP Growth | Electricity Growth | Electricity/ GDP Growth Elasticity |
|-------------|------------|--------------------|--|
| China | 9.5 | 7.6 | 0.8 |
| India | 5 | 8.4 | 1.7 |
| Pakistan | 6.2 | 10.9 | 1.8 |
| Indonesia | 6 | 15.5 | 2.6 |
| Malaysia | 6.3 | 9.1 | 1.4 |
| Philippines | 1.4 | 4.7 | 3.4 |
| Thailand | 7.9 | 11.4 | 1.4 |

Electricity has been the fastest growing form of energy in Asia, its shortages have also been most serious and visible. In many countries, growth rates over the past 10 years have exceeded 10 percent a year. Table 2 gives the growth rates of electricity demand in relation to the GDP growth rates in

seven selected countries.

The demand growth was such that it exceeded the existing supply capacity. As can be seen in Table 3, over the period of 1985-1990, the rate of capacity expansion was much lower than that of demand growth in four selected Asian countries, with the situation more or less similar in other countries.

Table 3
Growth Rates of Electricity Consumption and Generating Capacity Expansion (1985-1990)

| Country | Rate of Electricity Consumption (%/yr) | Rate of Capacity Expansion %/yr |
|-------------|--|---------------------------------------|
| Indonesia | 16.9 | 10.9 |
| Malaysia | 9.8 | 5.5 |
| Philippines | 6.5 | 0.8 |
| Thailand | 13.3 | 3.5 |

As a result of this demand/supply gap, there are few countries in the region that have not suffered from either blackouts or brownouts. Power shortages in China, India and Pakistan were all around 25-30 percent of the peak demand on national average in the early 1990s. In the Philippines, where power shortage was the most serious, there were frequent brownouts often exceeding 10 hours a day. It was estimated that in 1992, the level of power shortage corresponded to 48 percent of total system capacity, and cost estimates of this shortage amounted to US\$2.24 billion, or 3 percent of the country's GDP. In Malaysia, power supply shortage was about 5 percent of peak load. On 29 September 1992, due to a system failure, 80 percent of the population in Peninsula Malaysia were deprived of electricity supply during 33 hours. Blackouts or brownouts were also experienced frequently in other Asian countries.

Causes of Energy Insecurity in the Asia-Pacific

From the sectoral analysis of energy security in the Asia-Pacific, we can see that none of the four main energy sectors is worry-free, with security of electricity and oil being the most serious. Of course, these sectoral energy security problems are inter-linked: lack of available gas and coal increases the use of oil products, and shortage of electricity supply increases the use of diesel-based generators which leads to more diesel oil imports.

The apparent cause for increased energy insecurities is the rapidly growing gap between energy demand and supply. The demand growth, driven by the expanded economic activities and greater social needs, outstrips the rate at which domestic energy production capacity has been expanded. This imbalance is also a result of the low level of energy end-use efficiency, lack of sufficient investment in new production capacity, and low energy prices that encourage wasteful use of energy and reduce energy companies' self-financing ability in new energy projects. The institutional constraints, such as the lack of legal instruments for energy savings and the statutory monopoly of public utilities in energy production, are also important factors contributing to this imbalance.

These causes of energy insecurity can be more clearly explained in the Asian electricity sector. It has been often considered that lack of funding for investment in power generating projects and in grid expansion/ maintenance was the cause of the serious electricity supply insecurity in the

developing countries of the Asia-Pacific region. However, a significant amount of money was available, either in the form of large household savings or from the private sector. International sources of financing were also abundant. Therefore, lack of money was not the real cause. The fundamental causes were public monopoly and government ownership of the electricity sector. Together, they not only led to very inefficient use of the limited available public budget but also prevented the participation of private and foreign capital sources in the development of the power sector. Poor end-use efficiency and high transmission and distribution losses further aggravated the capacity shortage problem. Strong government subsidies to keep the electricity price very low and to carry out unprofitable rural electrification programs also absorbed a large portion of the public budget and contributed to the unhealthy financial situation of public electricity utilities. All these created a very insecure investment environment in the electricity sector.

How Has Reform Helped Improve Electricity Security?

To mobilize private and foreign capital sources for the development of the electricity sector, it was necessary to end the statutory monopoly of public utilities in power generation. Institutional reform was the first step taken by a large number of Asian countries in the late 1980s and early 1990s. Once the public monopoly ended, the next step was to create schemes for the participation of private or foreign entities in the power generation business.

Most countries started with independent power producers (IPPs). One reason for this is that this mechanism requires the fewest changes to existing institutional structures. The IPP structure also allows governments to maintain control of electricity generation at least in the short term. A number of countries published special rules and regulations for private and foreign investment in the power sector. They provided special provisions and guarantees for foreign investors, including incentives such as exemptions from import duties, favourable tax regimes, government guarantees regarding repatriation of investment and profits, protection against expropriation, land use rights and easier employment of foreign nationals, and fast-track administrative procedures for project approval. Private and foreign investors were also allowed in projects of plant renovation and rehabilitation. Thailand also encouraged the private sector to invest in renewable energy based small power producers (SPP) projects.

The second scheme for private participation is the sale of public utility assets, a mechanism usually related to the privatization of the public utility. It took the form of equity sales in the local financial markets or the sale of power plants to private investors. In 1992, 23 percent of the capital of Malaysia's National Electricity Board, renamed now as Tenaga Nasional Berhad (TNB), was sold on the stock exchange of Kuala Lumpur. Several thermal power plants of Pakistan's Water and Power Development Authority were sold to private operators in 1995. A varied form was experienced in Thailand where in 1992 the Electricity Generating Authority (EGAT) created a commercial subsidiary EGCO (the Electricity Generating Co., Ltd.) and sold its own thermal power plants to the subsidiary. EGCO was introduced into the Securities Exchange of Thailand in Bangkok to raise funds for its new development projects.

Financial markets have become an important structure

both for indirect participation of private and foreign capital in electricity development projects and for the electricity companies to raise the needed funds for their projects. In the past, many countries issued government utility bonds with a fixed rate of interest, but this practice is giving way to an emerging capital market that would provide more rewards to investments in efficient companies. Following the examples of Malaysia and Thailand, Indonesia and the Philippines are also considering introduction of their privatized national power utilities into local financial markets. Thailand plans to introduce all the business units of EGAT into the local stock market when those units are privatized during the next several years. A few Chinese power companies have already been listed on stock markets via Hong Kong, New York and London. Public participation via the stock market brings not only more capital sources but also additional pressure for improved management: a company listed in the stock market will have to use the generally accepted accounting principles (GAAP) and disclose its financial position to its shareholders.

While opening the electricity sector to private and foreign entities and establishing more structures for their participation, Asian governments also tried to improve the financial accountability of power utilities through commercially-oriented management. In Vietnam, the Ministry of Power was converted into Electricité du Vietnam, a national power company. In China, the State Electric Power Corporation was created in January 1997 to take over the managerial responsibilities of government power assets, while the Ministry of Electric Power still remains with the main responsibility of planning, regulation and policy formulation. In Indonesia, the Perusahaan Umum Listrik Nagara (PLN) was given the status of a commercial company in 1994 and became PLN Ltd. Improved financial accountability means also that different operations of the same power utility have separate financial accounting, and this is the starting point for the further commercialization of the utility's various activities.

Governments also changed their funding policy for power projects. The traditional practice of free government budget allocation has been changed, with the same governmental money being loaned with interest to project developers. Only those projects which are economically viable will be funded.

One of the most difficult issues related to the commercialization of public utilities is the social burden that utilities were obliged to carry in financing non-profitable rural electrification programs and in providing cheap or free electricity to low income groups. There were also important cross-subsidies among geographical regions and among consumer groups. The approach that was adopted by Asian countries was first to make the social charges, subsidies and cross-subsidies transparent both in the accounting system and in the electricity tariff structure, and then to gradually remove those subsidies. Where subsidies are still considered necessary, they will be administered from a separate governmental agency, not the power utility.

The importance of energy saving has also been recognized. However, the degree of commitment and efforts varies widely from one country to another. Thailand has a very ambitious energy conservation and DSM program under its

(continued on page 16)

Asia-Pacific Energy Security (continued from page 15)

Energy Conservation Promotion Act of 1992. Energy audit and energy conservation plans are required for buildings or factories with more than 1 MW of demand capacity. Voluntary agreements were also reached with appliance manufacturers and incentives were provided to the imports of energy efficiency products. The Act also created an Energy Conservation Fund with money from a 0.28 US cents/litre tax on oil products to finance the energy conservation programs. In 1990, Thailand also introduced the time-of-day tariff structure which has been effective for peak shaving.

Electricity trade, which is still very limited within the region, is also being actively developed, especially between Thailand and its neighboring countries. The hydropower resources of the Mekong River are also being exploited under the coordination of the United Nations' Mekong Committee.

All these reform and restructuring efforts have been developed into an integrated policy towards a market-based, open, secure and diversified electricity sector with long-term economic efficiency slowly beginning to acquire much higher importance.

The final results of these efforts remain to be seen. Already, electricity supply security in a large number of countries has been improved. In the Philippines, where the IPPs supply more than 30 percent of the country's electricity, the shortage problems have been greatly eased. The IPPs have also provided Malaysia with sufficient capacity to cope with the demand growth in coming years. In Indonesia, 6 power purchase agreements were signed in 1995 and 1996. Thailand and China also awarded their first IPP contracts in 1996. The electricity sector reform has enabled China to build 16 GW of new capacity annually over the last six years (an amount equivalent to the total installed capacity of a medium-sized European country), which has greatly eased the country's power shortage situation.

Many governments also took this opportunity of reform to revise and update the environmental regulations of the electricity sector and to strengthen their enforcement. Moreover, in anticipating that future environmental regulations will be more strict and that the enforcement of these regulations will be strengthened, the IPP developers prefer to invest in more environmentally friendly technologies at the stage of project development than to retrofit the installations in the future. Furthermore, use of environmentally sound technology is often considered an advantage in the evaluation of IPP bids. Thus reform of the electricity sector is also beneficial to the environment.

Lessons for Asia-Pacific Energy Security

The experiences in which the electricity sector reform improved its supply security can deliver some useful lessons for the oil, gas and coal sectors, which share more or less the same internal factors of supply insecurity as the electricity sector. Possible lessons could include:

1. First, there is a need for a change of mindset on how energy security can be best ensured. Traditionally, the electricity supply industry was considered to be strategic for a country, and the monopolistic nature of the industry would require public ownership and direct government intervention. But experience has shown that public ownership and

direct state intervention are not the best means of ensuring adequate electricity supply. Liberalization of the electricity sector allowing active private sector participation, as shown in Asia, can strengthen the security of electricity supply. Likewise, liberalization of coal, oil and gas sectors can also contribute to their supply security.

2. Liberalization does not mean retreat of government. Government still has an important role to play, especially in countries and sectors where public ownership is still very important. The role of the government has changed, i.e., from "energy provider" to "energy sector regulator".
3. There is a need for mobilising diversified sources to improve energy supply security. Institutional framework should be established to free market forces and allow all sources of capital and technology to invest in energy projects. Institutional constraints that prevent any of these sources from being utilized should be removed.
4. Domestic energy market reform should accompany the process of liberalization. Private investment in the energy sector needs a domestic market with a secure investment environment. Investors in power generation projects would need to consider the existing tariff structure of the country and the financial situation of the utility which will buy the generated electricity. Thus, for the investment to be realized in power generation business, market reform should be carried out to establish a secure investment framework, including a good financial position of the power utilities and sound tariff rates. In the same manner, opening up of the upstream oil sector would require the deregulation of the downstream sector, as it will provide easy market access for the produced crude. The same holds true for coal and gas investment.
5. The main objective of market reform is to build an open, efficient and flexible energy sector which is the best guardian for energy security. Various approaches that were adopted by Asian countries in the electricity sector reform could also be applied to other sectors. Such approaches include commercialization of public utilities, removal of their social burdens, and better financial accountability.
6. Development of electricity trade helps strengthen electricity supply security. This is certainly true for other forms of energy. In the coal sector for example, development of international trade, such as importing coal for the southern part of China and the southern and western part of India, could help to improve the coal supply security.
7. Energy demand management also contributes to energy supply security. Here a key challenge is to make the investment on energy savings as attractive as investments on capacity expansion. An effective way of achieving energy savings is to get the price correct, reflecting the true cost. Government directives are important for energy savings, but more market-compatible economic instruments should be applied. Managing the demand growth can also be achieved through the shifting of growth patterns toward less energy intensive industries.
8. The most important lesson will be that government policy plays an important role in freeing market forces to ensure energy security. Experiences of Asian electricity reform showed how market forces, once freed by a favorable government policy, have helped strengthen electricity

supply security. Market forces also exist in the Asia-Pacific region to improve the production of oil, gas and coal within the region, but current government policy, in terms of fiscal regimes, does not provide enough strong incentives to attract international capital and technology. The IEA study on *North African Oil and Gas*, published this year, showed that improved fiscal terms in Algeria, Egypt and Libya have significantly increased oil and gas discoveries and boosted the level of production.

To conclude, it can be said that the insecure investment regime (strong subsidies, low prices, poor financial situation of energy utilities, and unattractive fiscal conditions), inefficient energy systems (public ownership, strong government intervention, etc), and institutional rigidities (public monopoly, outdated regulations, slow administrative procedures) are among the most important internal causes for the insecurity of energy supply in the developing countries of the Asia-Pacific region. We showed how the reform of the Asian electricity sector helped improve the security of electricity supply through efforts toward establishing an open, efficient and flexible electricity market. We also showed how these experiences could be applied to other energy sectors to strengthen energy supply security.

As was mentioned earlier, energy security, especially that of oil, has some important external aspects to which the electricity reform in Asia is not so relevant. It is encouraging to note that important efforts are currently underway in the Asia-Pacific countries to strengthen these external aspects of energy security. These efforts include: 1) strengthening the energy linkages with the Middle East, Central Asia and the Former Soviet Union; 2) increasing interplay between foreign policy and energy issues; 3) improved regional cooperation among all concerned countries; and 4) building or improving emergency oil stocks.

However, these external efforts need to be complemented with internal ones, without which improved energy security will be limited. The experiences of electricity sector reform in Asian countries provides some useful lessons on how these internal efforts should be made.

Footnote

¹ The *Asia Electricity Study* looks at the current situation and the outlook for the electricity sector to the year 2010 in Indonesia, the Philippines and Thailand. It compares and contrasts existing and planned policies both among the three countries considered and with those adopted or tried in IEA member countries and seeks to identify where there have been lessons learned that might be transferrable. *Asia Electricity Study*, OECD/IEA, 1997, 307p.

Excess Refining Capacities... (continued from page 12)

new facilities to meet the growing demand for diesel oil. The quality of the products manufactured in the FSU is still, on average, low but the modernization projects are under way.

Will increased imports of products, from the FSU to Europe, and from Europe and Venezuela to the United States, be an alternative to costly investments for local refiners? The answer may be "yes", but there is a risk that large investments in refining in the FSU and other crude oil production areas will prevent any improvement in refining margins.

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An Evolutionist Analysis of Oil Competition and Oil Competitiveness Throughout Oil History

*By Edmilson Moutinho Dos Santos and
Jean-Philippe Cueille**

The goal of this paper is to analyze the evolution of the upstream part of the oil industry by using some analytical instruments established by Michael Porter (Harvard University). Initially, we will characterize the different oil actors that participate in the international oil industry. Then, by analyzing competition in upstream activities until the first oil shock of 1973, we will consider a situation of great competitive stability. Finally, we will envisage a situation of great instability, analyzing the case of oil competition during the 1970s and the 1980s. We can thus interpret the dissimilarities of behavior of the various oil actors as well as the temporal changes in their strategies in an attempt to explain the evolution of their respective role in an oil world that is perpetually changing.

The Main Oil Actors and Their Generic Competitive Strategies

Throughout oil history, there have been three distinct groups of oil actors that have found a place in the competition game: 1) the majors; 2) the national oil companies (NOCs) from oil consuming countries and/or from oil producing countries; 3) the independent companies (originally mostly American companies, but gradually from other countries as well). By associating these firms with the generic competitive strategies that we have presented previously, we will try to establish a new characterization of these three categories of oil companies.

The Strategic Positioning of the Majors

Their presence in the Middle East represented the most fundamental and significant criterion that distinguished the majors from the other oil companies. The control held by the majors over large Middle Eastern oil concessions from the end of the First World War until the first oil shock of 1973 allowed these companies to develop a cost leadership strategy. This domination became increasingly manifest as these firms consolidated their presence and their control over great oil reserves in the region. The issue was to keep full control over these great concessions, to maximize their production and to take full advantage of their huge geological asset. Furthermore, these companies have always favored a very international approach, that is, broad-target, competitive scope.

After the wave of nationalizations of the 1970s, the majors were obliged to orient themselves to more technologically sophisticated sub-segments of the upstream industry, while maintaining their international approach. Thus, we can say that, after the first oil shock, the majors were forced to abandon their former strategic positioning, and develop a new broad-target strategy, based on technological differentiation. Henceforth, the characteristic common to all the majors seems to be essentially their capacity to be present in the most

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sophisticated upstream activities and their degree of internationalization.

The Strategic Positioning of Independent Companies

The oil industry has probably been the one in which small- and medium-size firms have found the most fertile opportunities to share the market and to coexist with larger corporations. This coexistence is fundamentally explained by the fact that, within the oil industry, a certain number of activities are not always undertaken efficiently by the majors. This has opened up interesting possibilities for independent companies to establish themselves in some segments of the industry.

The appearance of independent actors seems also to be strongly linked to the existence of reasonably favorable conditions for entering the industry. Concerning the upstream activities of the oil business, the United States is the country where the barriers of entry have always been the lowest in the world. Consequently, it is not surprising that the United States has by far the greatest number of independent upstream companies. Most of these firms often operate in segments of the business that have been gradually abandoned by the majors. They focus their activities on the most mature regions and on segments that require a lower level of technology.

Recently, the American picture has been partially extended to the rest of the world. This shows that "geographical positioning" constitutes a fundamental parameter of strategic segmentation in the upstream business. Indeed, most independent companies operate on a national (or even regional) level. This geographical specialization constitutes their major attribute, because these companies are able to operate in already well worked regions with costs that remain competitive. This is why we can normally consider the independent companies as being competitors that concentrate on certain activities. They adopt a geographic focus strategy, based on costs. Throughout oil history, this strategy has appeared to be defensible.

The Strategic Positioning of National Oil Companies (NOCs)

As fast as the oil industry has developed and oil has become more important and more strategic for nations, governments have reconsidered their own political strategies vis-à-vis this sector. The political climate of oil activities has changed, with direct impact on competition within the industry. The strengthening of the relationship between oil and policy has induced an increasing sense of oil nationalism. This nationalism then allowed the creation and the expansion of many national oil companies (NOCs).

Apparently the only aspect that is common to all NOCs is the extremely close relationship between their interest as commercial enterprises and the national interest of their country. Most activities of NOCs are developed within their home country, aimed essentially at the promotion of the national interest of the country. Sometimes, these companies are considered as an "emanation of their government" to control the national oil industry. Therefore, what makes NOCs a special case in the oil industry is the particular relationship with their home country and the way in which the country sees its oil company as a strategic national asset.

Due to this characteristic, these companies end up by creating an interesting and significant strategic position.

NOCs are basically competitors that concentrate on their national market. They build their generic strategy upon the geographical dimension. By developing their national natural resources, they seek to reach a competitive advantage in their target segment. Given the various mechanisms set up by the state to protect them and to help their development, NOCs benefit from a competitive advantage of a political order, which ensures the viability of their differentiation focus strategy. This strategic positioning has allowed them to develop strong technical and commercial capabilities, and sometimes even to launch themselves into international activities.

The Path to Stability and the Challenges of Stable Competition Before the First Oil Shock

Oil history, from the origin of the oil industry in 1859 in the United States until the end of the Second World War, characterizes what can be called the path to stability of oil competition. This path has been built gradually. Its history is mainly the history of the strategic positioning of the oil companies and the consolidation of some dominant forms of competition. This stability became a reality after the Second World War and endured until the first oil shock in 1973.

The different strategies of the various oil actors that have gradually been transformed into dominant forms of competition were essentially the vertical integration of the oil companies, the horizontal integration and the internationalization of the majors, the ideological differentiation of NOCs and the geographical concentration, based on costs of independent companies.

The horizontal and vertical integration of the majors has taken on an extremely important dimension in the oil industry. It has become the key element of the dominating competitive paradigm of the period. Horizontal integration, by binding the most important oil companies to each other, has proven to be an essential instrument in eliminating disastrous competition, allowing these companies to stabilize and to coordinate their competitive environment, and preventing their cost advantage from degenerating into price wars.¹

Indeed, the rules that guided the operation of the oil consortiums in the Middle East established that any increase in production capacity within the consortiums had to be negotiated and decided with unanimous approval. Individually, no company could build up excess capacity in the most prolific oil province in the world. Therefore, the majors could not profit fully from their cost advantage in this region.

Vertical integration guaranteed outlets for growing oil production. It allowed firms to minimize their fiscal costs by allocating profits to affiliates that were subject to lower rates of tax. Furthermore, it allowed the majors to smooth short term imbalances between demand and supply. Finally, it turned out to be a very effective strategy by which new independent companies could establish their own place in the oil market without becoming dependent upon the majors.

In spite of their huge oil reserves in Venezuela and in the Middle East, the majors have continued to develop a strategy of internationalization. The level of production in the Middle East being defined by very constraining rules within the consortiums, the issue was to find other sources of oil that

could be freely developed and used. Even if these new sources were not as cheap as those in the Middle East, the fact that they could be managed with more "suppleness" represented an important competitive advantage.

Fundamentally, this set of dominant forms of competition has led the oil industry to a certain stabilization. Having found their specific strategic positioning within the oil industry, all competitors (the majors, NOCs and the independent companies), have benefited from a very stable competitive environment, strong growth and a general reduction of risks. The international upstream business has experienced a long period of strong growth with stability. The dominant strategies have become very evident and durable. The changes in competition were only marginal and gradual. In addition, despite the precocious internationalization of the business, the industry was not truly exposed to the challenges and the difficulties that usually characterize a "global business" and global competition.

This state of affairs prevailed in the upstream sector of the international oil industry for more than twenty years until the outbreak of the first oil shock in 1973. Nevertheless, by the end of the 1960s, a gradual degradation of the political and economic fundamentals of this competitive paradigm had already begun to dawn.

The rapid expansion into international upstream activities of numerous firms belonging to the independent and NOC groups entailed an escalation of competition and released a series of aggressive competitive strategies. The newcomers have begun to compete with the majors on their own ground, especially in the Middle East. Struggles between the majors, the new international actors and governments have subsequently modified the distribution of power within the industry.

The political and economic transformations that occurred at the end of the 1960s and the beginning of the 1970s have resulted in a gradual loss of political and economic stability in oil competition. Thus, the process that led to the outbreak of the first oil shock in 1973 had a rather endogenous origin, with gradual development. The origin of oil instability of the 1970s must, therefore, be found in the evolution itself of competition during the period of stability.

Oil Competition During the Period of Crisis

The notion of oil crisis from the viewpoint of the upstream sector has a very singular meaning. The oil shocks in 1973 and 1979 did not simply create problems for the industry. They relaunched the profitability of upstream activities, allowing oil companies all over the world to improve their profits. They also opened up new and more sophisticated segments in the industry, creating new opportunities for investment that were not available when prices were low. On the other hand, these two shocks triggered a strong wave of political instability.

The counter-shock of 1985-86 entailed a radical modification in the competition paths. Oil prices declined very rapidly, jeopardizing the profitability and even the existence of some oil companies. All the oil actors had to adapt to the new economic context. On the other hand, the political situation of the industry began to decline.

In an evolutionist perspective, the 1970s and the 1980s were nevertheless characterized by an important common

(continued on page 20)

¹ See footnotes at end of text.

An Evolutionist Analysis... (continued from page 19)

element, that is, the instability, the uncertainties and the growing risks imposed on the oil companies. We witnessed the complete upheaval of the old industrial structure. In particular, we saw the disintegration of the oil industry, and consequently the erosion of the major instrument that used to guarantee competitive stability in the years preceding 1973.

Regarding the strategic redeployment of oil companies, the changes were violent. To a large extent, this global and radical repositioning of firms became the most important driving force towards the acceleration of competition and the escalation of instability.

After nationalization of the upstream activities in the largest producing countries, the majors lost their cost leadership and became broad-target differentiators. Sheltered by higher crude oil prices, the majors began to put into effect a technological differentiation strategy, allowing them to have preferential access to new producing regions (the North Sea, Alaska, and increasingly deep offshore areas), at the limit of existing technological capabilities.² Furthermore, the need to find new sources of crude to compensate for the losses in the Middle East brought the majors to strengthen their internationalization policy, making them increasingly broad-target competitors.

The independent companies did not really change their generic strategy. Essentially, they continued to adopt the same geographic focus strategy, based on costs. Even after the decline of international oil prices in 1985-86, most independent companies were able to defend their position in the market.

Finally, due to growing politicization of the oil industry, all the NOCs grew substantially during the oil crisis. In fact, the crisis substantially improved the competitive position of all political and ideological focus strategies.

In particular, NOCs from the producing countries became the new cost leaders, with their immense low cost oil reserves. However, since their activities were essentially centered on their national territory, where they had to maintain special political relations with their government, these firms often had to face other costs (for example, high organizational costs), which partially undermined their geological advantage and cost leadership. Thus, these companies could not enjoy the same cost leadership as the majors did before 1973.³

Yet, new NOCs were created or expanded in many

smaller producing countries. This new wave of internationalization in the upstream business contributed to unstable competition. Indeed, small producers have a different oil rationale. Their level of production is closely linked to their domestic political and economic limits. These countries are less concerned with the international problems of the oil industry. In addition, the incorporation of these countries into the world oil supply system put the majors in direct competition with many of these new NOCs. Consequently, not only have we seen the integration of new countries into the world oil supply system, but also the integration of new enterprises, a new oil logic, and new frontiers of competition.

Regarding the dominant forms of competition, the most traditional dominant strategies were weakened or disappeared, while other strategic options were proposed, but with less credibility. Many innovations (endogenous and exogenous) were produced, completely transforming some competition parameters. Furthermore, firms reacted to events, introducing other changes that were often even more fundamental. It was a question of outstripping the other competitors in adapting to the new challenges of competition.

Considering all the transformations that developed in the upstream industry during the 1970s and the 1980s, it was obviously not just a question of financial and economic changes. Indeed, during this period, oil competition was greatly politicized. OPEC was both the major actor and the emblematic figure in this process. More than ever, oil history was marked by political conflicts involving countries and companies.

Footnotes

¹ The competition between the majors had to be limited because it was a question of maintaining a certain level of stabilization so as to protect the structure and the general profitability of the industry as well as the huge investments committed. In a sense, it was not a question of developing strong competition between the oil companies, but rather of cooperating with each other so as to reduce production, transportation and logistics costs, thereby improving the general competitiveness of oil compared to other sources of energy.

² This strategy has been considered the best answer for the majors to improve their relative position vis-à-vis their competitors, NOCs and independent companies. Based on their technological capability, the majors wanted to strengthen their competitive position by increasing the technological barriers in the most sophisticated upstream activities, making it very difficult for

(continued on page 24)

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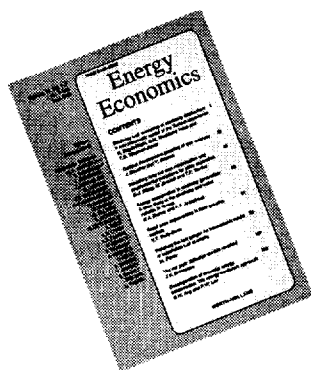
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1998: Volume 20 (6 issues)
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7HC07A01 - SDV

The Role of Chief Economist in a Major Oil Company

By Peter A. Davies*

This paper is being presented as part of a session on the role of Chief Economists in oil companies. Many would query why the session is being held, but it appears to address a number of questions that continue to be asked within the energy economics profession:

1. Why have corporate energy economists become a dying breed in recent years?
2. Does energy economics have value in the 'real world'?
3. How do large organizations work and how do economists fit into this apparently opaque world?

In addressing these questions this paper is structured as follows:

1. What are the trends in the use of economics in oil companies?
2. How is it used in practice?
3. How is it organized?

Trends in the Role of Economists

Modelling the Predictable World

In the 1960s the world seemed predictable. Growth rates were relatively stable, allowing for periodic cyclical recessions. Economists found modelling easy: more of the same in most cases. The models seemed to work.

The macro models were supplemented by linear programming models to optimise the industry's flows: refinery runs, supply sources, etc. The number of economists increased.

Analyzing and Forecasting the Uncertain World

But this world was not to last. The straight lines were not straight for ever. Oil prices quadrupled in 1973-74. The world economy lurched into a new, less predictable era. The models broke down.

This was not the end of the economists, but it led to a new period that was to last 5-10 years. Two new approaches emerged:

1. The building of new more complex models that attempted to simulate the behaviors of key players in the oil market - especially OPEC. 'World Oil Models' were built that considered OPEC capacity utilization, OPEC finances and future non-OPEC production. They tended to claim that they could explain the recent past volatile behavior and could forecast future oil prices and volumes. I think they all failed - many spectacularly.
2. Scenario Planning became a favored process. It was acknowledged that the future was uncertain and unpredictable. But it is possible to analyze and understand driving forces, key uncertainties and specific 'givens'. This allows an assessment of alternative futures. Strategies and projects can be tested against such scenarios. The process of their

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compilation enhanced understanding of the way the world or specific markets worked and allowed the decision maker to understand which case was prevailing at a particular time.

These were predominantly phenomena of the 1980s. Unfortunately the new models generally failed to predict the 1986 oil price decline and to analyze meaningfully the new post-1986 era. Scenario planning was more successful initially, but in many companies its use in decision making was felt to be limited. It often didn't help to 'pick winners'. In many instances the main weakness was that the scenarios were not used properly. Central cases dominated, with occasional downside testing.

Cutting Back

As the industry struggled to adapt to lower oil prices and low profitability in refining, the resultant cost pressures did not escape the economists. Economics departments were cut and merged into other groups. In many cases they were scrapped completely.

Contracting out became the name of the game. It was cheaper to buy in a reputable forecast from an external supplier than to employ even a small number of economists in-house. If predicting oil prices is impossible, why employ economists to try and do it? It was easier for senior management to pick a cautious number and run the company on that basis. Many did.

The New Paradigm?

Is this where we are today? Or is there a different, more constructive role for economists in the oil companies today? I think that the answer is, "yes", but that does not mean that we have forgotten all the lessons of the past:

1. We cannot predict oil prices accurately. We shouldn't try. But this does not mean that we cannot increase the understanding of current and future trends in oil and other energy markets. This allows better decisions to be made.
2. Scenarios are not an all embracing method of understanding the future. But again, the process of considering driving forces and key uncertainties can help better decision making. Insightful analysis of external forces is key to good decision making.
3. Contracting out is very often efficient. It permits scale economies in collecting non-proprietary information: we shouldn't all count the number of boilers or calculate inventory levels. It also gives access to the best information. But there are areas where it does not work, not least where the company is an active participant in a particular market.

I believe there is a form of new paradigm for economists in energy companies. The revised role involves three core elements:

1. Accessing best information,
2. Providing sound analysis of that information, and
3. Communicating the analysis effectively to those who need it to assist in ensuring that better decisions are made.

In all cases the key is aiming to get better decisions and getting rid of bad ideas and myths.

The Role

Within BP, economists have four relatively distinctive roles:

Energy Analysis

The economists lead the company's analysis of oil and other energy markets. An understanding of energy market developments and prospects is key to good decision making at both the macro strategic level and the more micro project level.

We aim to do this in a number of ways:

1. We aim to access best information. We act as informed buyers to access the best sources available externally. We supplement this with our own proprietary information from our activities. In addition we aim to access 'privileged information'. These are insights that we obtain from our relationships within the industry: from our partners, customers, suppliers etc.
2. We aim to provide insightful analysis. I believe that this requires employing only first class economists. There is nothing more dangerous than a poor economist.
3. We aim to communicate effectively. This used to mean having good writing skills. Verbal presentation skills then grew in importance. Today the skill set is more complex and involves many IT skills: not just graphics but use of the Internet and intranets and increasingly, video linkages and multimedia. Decision makers must have the best analysis accessible when they need it and know how to obtain it.

Energy analysis will remain at the core of the economist's role in oil companies. The role is not an attempt to predict the oil price with any accuracy. It is much more understanding, predicting and communicating energy market structures and trends. Again the aim is to lead to better business decisions.

Macroeconomics

Macroeconomics is important for oil companies. Economic growth drives energy consumption. Petrochemical markets are critically influenced by economic cycles and trends. Longer term economic forces influence future markets and growth opportunities.

But it is not necessary for oil companies to develop leading edge macroeconomic skills to the same extent as in energy analysis. We do not need to be able to predict next quarter's GDP with pinpoint accuracy. In practice this means that we can be informed buyers of most of the macroeconomic analysis that we need. In many cases we do not know the answer to many issues – but we know somebody who does.

Our job is to find the best source of macroeconomic information for our needs. It requires us to be able to identify what information is required. It also requires us to be able to provide it in the form that is needed within the company.

Applying Economics to Business Issues

The application of economics and economic analysis to business issues has become increasingly important. It has become understood that economists have strong analytical skills that allow them to assess an issue in a different, and often more structured and insightful way than those with other disciplines.

The list of areas where practical economics is applied is wide and ever changing. Within BP, for example, it has included, in no particular order of importance:

- environmental economics
- corporate level strategy
- country risk analysis

- analysis of industrial structures
- financial economics including issues such as the cost of capital
- value chain analysis
- national economic issues such as competitiveness and the single European currency
- economic impact studies e.g., the impact of a major oil or gas development on a country or region

The key is the best information, good analysis and effective communication to ensure better decisions.

Stakeholder Interactions

Economists seem to be unable to keep their attention exclusively on internal company issues. To some degree this is because economists are one of the key sources of external market intelligence. They have to look outward. They bring the external world into large corporate structures which have an inevitable tendency to look inwards.

Economists are also used to interact regularly with stakeholders: shareholders, customers, suppliers, partners, governments, communities and financial markets. Why? There appear to be two main reasons:

1. Stakeholder relationships involve the sharing of information. This is usually focused on the company's views and understanding of the markets in which they operate. This involves sharing to ensure that better decisions are made where companies interact with stakeholders. It is also a case of due diligence: is the company making soundly based decisions? The economist's role is often to share and communicate the company's understanding of the markets in which it operates.
2. Secondly economists are often used to communicate the company's views to decision makers – often governments. The aim is thus to get better decisions outside the company as well as inside.

How Does the Chief Economist Fit into the Organization?

The working of a large corporation is usually a source of wonder, incredulity and confusion to those who are outside. The sort of questions that are asked by economists who are recruited into the company include:

- which department do you work in?
- who do you report to?
- how do you determine your priorities?
- how do you communicate your messages to ensure better decisions?

Within BP the economists have, over the last decade, sat within a plethora of corporate structures. We have been part of a Corporate Planning Department, reported directly to the Chief Executive, been free standing, part of a wider executive support team and a number of combinations thereof.

There is no 'ideal' structure. The role has to depend upon the structure and operating culture of a particular company. In general, the group has to be positioned centrally as many of the issues that economists address are at the level of the corporation and are important for more than one business operating unit. The main need is to ensure that the work of the economists has an impact. It has to be listened to and respected. It has to be rigorous, high quality and objective.

(continued on page 24)

The Role of Chief Economist...*(continued from page 23)*

If that is the case, the particular location and reporting lines are essentially irrelevant.

Finally, there is the issue of priorities. An economics team can charge for its services or it can be block funded. Our experience has been that the transactions costs of cross charging are too high and make it impractical. Within BP we will not make a cross charge of less than £100,000 - US\$160,000. This precludes many of the economists' activities. If no cross charging is made, the price of the service is zero and demand tends towards infinity. The problem is enhanced as our role is expected to be both proactive and reactive. How can the time of economists be allocated efficiently?

We have found that the most effective process is that of annual performance contracts and quarterly performance reviews with our key customers. The annual contract defines broad objectives and milestones. The quarterly reviews assess performance against these objectives and permits resolution of priority conflicts. Such processes fit well within the wider BP performance oriented culture.

Conclusions

This paper has tried to set out the key elements of the role of the Chief Economist and economists in general within BP. The role has changed fundamentally over the last decade as the oil industry has restructured and reoriented itself. There are less economists - but there are still some and the role is still valued. They are more focused in their tasks and more performance oriented. Contracting out is now commonplace, but has not completely replaced in-house economists.

The role of economists is to produce better decision making. This requires the best data, first class analysis and state-of-the-art communication skills. Only first rate economists have a role in successful oil companies.

An Evolutionist Analysis...*(continued from page 20)*

newcomers to enter.

³ Nevertheless, the counter shock of 1985-86 can be interpreted as the realization by Saudi Arabia that OPEC could only hope to resume its dominant position if it succeeded in doing away with the differentiation strategies of other competitors by an aggressive cost strategy.

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The International Petroleum Industry - Its Influence on South African Oil Companies

*By Jacques Magliolo**

South African petroleum companies are faced with a fundamental economic and political paradox. Economic sense suggests that the time has come for the local industry to face a complete demise of tariff protection for listed Sasol and State-owned Mossgas. Yet local politicians continue to promote commissions and task teams to assess deregulation, but ultimately do little to seriously undertake a radical restructuring of this industry.

The State's hesitation to remove regulations, in particular the Service Station Rationalization Plan (called Ratplan) and the Petroleum Products Act, may be related to political agenda. The Ratplan is essentially a government control on where service stations are opened, or closed, how these are operated and whether self-service can be implemented or not.

The African National Congress led South African government says that scrapping Ratplan would result in massive station closures and, therefore, unemployment. Our estimates are that, at most 150 stations would close in the entire country, causing about 1,500 retrenchments. That is hardly likely to increase South Africa's 40 percent unemployment rate out of a population of 39 million people.

The Petroleum Products Act relates to the State's control and taxing of fuel prices. A removal of this Act questions the ANC's belief that companies should operate under a free market system. Perhaps, it is more relevant that government would lose the 45 percent fuel tax it receives from every petrol user.

To confuse matters further, Mineral & Energy Affairs minister Penuell Maduna recently said the State's oil-related assets could be consolidated and listed on the JSE. Does this mean that the industry is to get some clarity on the State's position for the future of the industry? Or is there some other agenda in place?

To understand these issues, it is necessary to look at present and future international oil trends and to assess how South Africa fits into the global arena.

The International Arena

Throughout the world, geologists agree that low cost (known) petroleum production resources of the Middle East should be exploited first. These hold 63 percent of global proven, recoverable reserves of crude oil and natural gas. Yet, oil prices and supply imbalances created by OPEC in the 1970s have prompted heavy investment in new, high cost fields. Today, 75 percent of international oil and gas investment is being spent in expensive OECD countries, which have only 6 percent of proven global oil reserves.

In addition, OECD reserves are being depleted much faster than in other countries and there is a growing commercial and political alliance between the Commonwealth of Independent States (CIS) and the Gulf region, which could see the creation of a considerable economic and political force against the rest of the world.

Could these factors lead to a rapidly diminishing supply of international petroleum? does the CIS/Gulf alliance mean

* Jacques Magliolo is a financial author and investment strategist at South African stockbrokers C.A. Miller de Kock & Co.

oil prices will continue to be manipulated in the future? In terms of South Africa, a diminishing world supply would put credence to the State's lack of action to rid itself of storage facilities created during the Apartheid years and, secondly, the State could have an argument to keep the Petroleum Products Act in place to maintain a reasonably steady oil price for South Africa.

An assessment of international reserves and trade provides a better understanding of difficulties associated with the instant and complete deregulation of the South African petroleum industry.

Reserves

Globally, proven oil reserves are continuing to rise with new finds and re-evaluations of existing fields. In 1996, there were notable additions to reserves from Angola, Argentina and Colombia. Successful oil exploration along the Southern coast of South Africa (Oribi field now supplies 6 percent of South Africa's daily consumption), has resulted in a profitable government contract with Phillips Exploration International, Energy Africa and Sasol to explore for oil along the Eastern coast of South Africa.

At the 1996 production rate of 70 million barrels per day, proven global reserves could meet demand for 40 years. International experts vary in their forecasts, but our conservative estimate shows that by the year 2015 consumption of oil products should reach 100 million barrels per day, but that production will easily meet this demand.

In addition, there are twice as many new oil finds globally as in the Middle East, which indicates that mid-east reserves are expected to diminish relative to world reserves within 20 years and, therefore, the supply of petroleum will not diminish much in the long term. South Africa has no reason to keep storage facilities.

International Trade and Prices

The Middle East controls 52 percent of total exports and the United States, Western Europe and Japan are increasingly becoming more dependent on oil imports. However, the OPEC cartel has been unable to manipulate prices for at least the last 10 years. This was amply displayed on May 12 this year when market forces pushed the price of crude up by one dollar a barrel.

The movement was due to a series of international events

that had nothing to do with OPEC's control or ability to disrupt crude flows. Two of the world's main oil exporters, Iran and Colombia, suffered earthquakes and a major North Sea oil terminal in the Shetland Islands was blockaded by fishermen over payments disputes arising over claims that fishing had been affected by an oil spill.

Essentially, forecasts for the next two decades are that crude prices will remain steady, ranging between US\$19/bl and US\$25/bl, with worst case scenarios pushing the price up to US\$36/bl. A stable crude price removes the State's argument that it is important for them to smooth out fluctuations through the Petroleum Products Act.

Consolidation and Listing of Oil Assets

If there is no real reason to keep these Acts in place, why not remove them? And why consolidate and list State Assets? The first answer possibly lies in Pik Botha's inability to wade through the Government of national unity's (GNU) red tape in 1994 and 1995. Maduna's reasons are slightly different. Now that we are near the run up to the 1999 election, the ANC cannot afford to have problems with its Alliance partners, even if unprofitable service stations should be closed. After all, a deregulated industry would hurt downstream operators like black empowerment companies of Naledi, Afric Oil and Bombanani.

So what is the answer? Petroleum is recognized by all African States as the single most important product that could lead this continent into an economic renaissance. For sub-Saharan Africa, the Southern African Development Community (SADC) is the preferred avenue to access this R350 billion industry, which could grow by 56 percent between 1996 and 2015. This would be dependent on an improved infrastructure to access, exploit and deliver crude. Without this structure, production of oil could grow by only 10 percent, which will turn sub-Saharan Africa into a net importer of oil.

Therefore, it is logical to create a mechanism to access this forecast growth. Under a listed scenario, the free market would fund expensive exploration into the interior. After all, the ANC could then turn its alliance partners and black empowerment groups into shareholders and force them to close unprofitable service stations.

If you don't understand an industry, remove yourself from it, but be perceived to be undertaking sound economic principles. Either way, the State wins.

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Issues Facing the United States Strategic Petroleum Reserve

By John D. Shages*

In 1975, the United States took two major energy security steps in response to the 1973-74 oil crises. Passage of the Energy Policy and Conservation Act (EPCA) authorized the United States to join other oil consuming nations in the International Energy Agency and authorized the creation of a Strategic Petroleum Reserve (the Reserve) of up to one billion barrels of oil. EPCA also laid out a very precise format for policy related to the Reserve. Some timetables were written into the legislation, but for the most part the creation of the Reserve was to be detailed in a Strategic Petroleum Reserve Plan. That Plan was required to be submitted to Congress, and changes to the Plan required amendments to also be prepared and submitted to the Congress prior to implementation. EPCA and the Reserve Plan as currently amended require that the Department of Energy have a Reserve with 750 million barrels of capacity, that oil be acquired for the Reserve as rapidly as possible, and that the Department submit a plan amendment for expansion of the Reserve to one billion barrels.

Deviations from Course

In 1991 the Department did reach a storage capacity of 750 million barrels with completion of Big Hill, the fifth Reserve site. However, due to increasing concerns about the Federal budget deficit, Congress began stripping the Strategic Petroleum Reserve program of its appropriations for oil acquisition after the Gulf War in 1991. The last oil was acquired in 1994 and the Reserve's inventory peaked at 592 million barrels. Because of the lack of funds to acquire oil, the Department then decided not to complete its plan amendment for a one billion barrel reserve, reasoning that no new capacity would be required until fill could be resumed. Then in 1993, the Department discovered a structural flaw in one of the SPR storage sites, the Weeks Island mine. The Department determined, after reviewing all of the geologic data, that the integrity of the mine could not be trusted, and began the process of decommissioning and abandonment. The loss of the 70 million barrel Weeks Island site reduced the total storage capacity of the Reserve to 680 million barrels.

Unfortunately, the loss of the Weeks Island site precipitated another round of reversals for the Reserve. The estimated cost of decommissioning and abandonment was \$100 million - funds not anticipated to be included in the Department's shrinking FY 1996 budget. The solution was to propose a one time sale of \$100 million of the Reserve's oil to cover the decommissioning costs. While the Administration and Congress agreed to the Department's proposal, the sale established a precedent for non-emergency oil sales. As a result, an amendment to a later FY 1996 appropriations act directed the Department to sell \$227 million worth of oil to allow the funding of education programs. Again in FY 1997, although opposed by the Department, the appropri-

*John D. Shages is Director, Policy and Finance, Strategic Petroleum Reserve, U.S. Department of Energy. This is an edited version of his talk at the 18th Annual North American Conference of the USAEE/IAEE, September 7-10, 1997, San Francisco, California.

tions act passed by the Congress directed the Department to sell \$220 worth of oil, an amount equivalent to the appropriation for the Reserve's operations, maintenance and management. At that point some members of Congress, most notably Senator Murkowski, Chairman of the Committee on Energy and Natural Resources, and Chairman Schaefer of the House Subcommittee on Energy and Power of the Committee on Commerce, took exception to the concept that oil could be sold from the Reserve on a year-to-year basis without knowing when such sales would stop or when progress would be made toward the objectives stated in EPCA and the Reserve Plan. The Department agreed with this assessment and also agreed that it would prepare for the Administration a Statement of Policy on the Strategic Petroleum Reserve. That Statement of Policy will be a guide for the Administration and also give notice to Congress of the limits to which it can go to the SPR "piggy bank" for funds.

Public Comment

The Department of Energy has conducted numerous studies and issued many reports over the course of years on virtually every aspect of Strategic Petroleum Reserve policy, facilities development, size, and financing. Most of the analysis has been performed by Government analysts, contractors, and interested academics. While there was a natural temptation to revisit all of the issues in the same way for the Statement of Policy, 1996 had presented a number of challenges to the Reserve that indicated a growing public awareness of its potential for impacting markets. The two most notable events were the sale of crude oil during the Spring 1996 gasoline price spike and the debate over the creation of a regional heating oil reserve that occurred in September and October 1996 when prices rose to unseasonable levels. Because of that heightened public interest in the Reserve, the Department determined to augment its analysis of Reserve issues by posing open ended questions about the major Reserve issues to the public, oil industry, public interest groups, state governments and think tanks. A Federal Register Notice to that effect was published on April 30, 1997, and comments were received through July 16, 1997. The Federal Register Notice posed the following questions:

1. Should the United States continue to maintain a Strategic Petroleum Reserve?
2. What should be the size and composition of the Reserve's facilities and oil inventory?
3. How should Reserve oil be distributed?
4. What should be the drawdown and distribution capability for the Reserve?
5. What is an appropriate policy for revenue raising sales from the Reserve?
6. Should the Reserve's facilities be available for alternative uses?
7. Should the Reserve attempt to raise funds through alternative financing, innovative financial instruments, or buying and selling inventory?

The Responses:

In response to the Federal Register Notice the Department received comments from:

- 8 oil companies
- 9 associations and interest groups, including the International Energy Agency

- 11 states, including the Interstate Oil and Gas Compact Commission
- 101 individuals
 - East Coast (8)
 - Gulf Coast (73)
 - Mid West (8)
 - Rockies (3)
 - West Coast (9)

Issue 1: Should the United States continue to maintain a Strategic Petroleum Reserve?

Responses to the Department of Energy's Federal Register Notice support the Administration's recent assertions that the need for a Strategic Petroleum Reserve is just as critical now as it was when the Reserve was created in the 1970's. The overwhelming majority of respondents support the continuation of the Strategic Petroleum Reserve program as it is now constituted. Supporters of maintaining the SPR include nine out of ten state and government agencies; eight petroleum or petroleum related companies; seven major nationwide organizations including the Independent Fuel Terminal Operators Association, Petroleum Industry Research Foundation, National Petroleum Refiners Association, the National Association of Manufacturers, the Chemical Manufacturers Association, American Petroleum Institute and the National Council of Farm Cooperatives; and numerous individuals. The State of Washington wants a Strategic Petroleum Reserve but wants the cost and burden of its maintenance transferred to the petroleum industry.

Issue 2: What should be the size and composition of the Reserve's facilities and oil inventory?

The public interest in the Reserve's size and composition was highly correlated with the level of familiarity and association with the oil industry. Among the companies and associations responding to the notice the most common response (seven) was that the Reserve should have the equivalent of 90 days of imports (about 780 million barrels at current import levels), PIR, Inc. endorsed an interim level of 680 million barrels, and four companies endorsed the current level of 563 million barrels. All companies endorsed the continuation of an all crude oil reserve, citing the flexibility of crude oil. All companies and associations, but for The Science and Environmental Policy Project which recommends not having a Reserve, endorsed the current level of reserve or larger. The states responding were less certain, with only six of ten states expressing a size preference and recommending five different sizes ranging from a minimum of 500 million barrels to one billion barrels (two states recommend a billion barrels). Only two states (Indiana and Louisiana) said that refined products might be considered but they did not endorse specific products or a size for a refined product reserve.

Issue 3: How should Reserve oil be distributed?

Of the many respondents to the question of how the Reserve's oil should be distributed, most endorsed the current concept of unrestricted public sales to the highest responsible bidder. No respondents preferred distributing SPR oil by any means other than the existing competitive sales process, and most recommended a continuation of the current process without change. Three respondents advocated that the sale be

limited to U.S. refiners, petrochemical companies, or petroleum marketers having established processing agreements with refiners. One of these three companies also wanted foreign and domestic speculators excluded from the eligible bidders to prevent possible hoarding of supplies to take advantage of price rises. Some commentators observed that processes could be improved to speed the sales and deliveries.

Issue 4: What should be the drawdown and distribution capability for the Reserve?

Only 60 percent of the oil companies, industry associations, state energy offices and organizations responded to this question regarding the desired drawdown and distribution capability of the Reserve. The majority of the oil companies indicated that the proposed drawdown rate of 4.5 million barrels per day is currently adequate for the SPR. However, a number indicated that this rate needs to be periodically reviewed and potentially increased in the future in light of the rising U.S. import levels. The oil industry also expressed confidence in the Department's ability to establish and maintain an appropriate drawdown rate for the Reserve.

In general, the few associations that opined on this issue indicated support for the planned drawdown rate of 4.5 million barrels per day. In contrast to the oil industry and associations, the state energy offices and state organizations expressed overwhelming support for restoring the Reserve's drawdown rate to 60 percent or more of the U.S. daily import rate. Responses from the general public to this question varied considerably. In general, the majority of responses were almost equally divided between the SPR's current drawdown capability and increasing the SPR's drawdown capability to a level between 50 and 60 percent of the U.S. daily import rate (the 50 to 60 percent objective equates to a 5 to 6 million barrel per day rate in 2005, and 6.5 to 7.2 million barrels per day by 2015).

Issue 5: What is an appropriate policy for revenue raising sales from the Reserve?

A majority of the respondents to the Federal Register Notice opposed further sales of Strategic Petroleum Reserve oil for deficit reduction purposes. This position was supported by 100 percent of the petroleum company, state offices and association responses. Only four out of 97 respondents explicitly advocated sales. One individual suggested that the receipts from the sales be used only for the maintenance of the Reserve. Many respondents urged that the Government only buy oil when prices are low and only sell when prices are high.

Issue 6: Should the Reserve's facilities be available for alternative uses?

The majority of the respondents to the Federal Register Notice favored the lease of unused Strategic Petroleum Reserve capacity to other stockpiling nations. A number of respondents counseled that the Government should proceed with caution on provisions to allow foreign entities to store oil in the SPR and assure that foreign entities agree to terms and conditions that would allow the U.S. to access its own oil without hindrance. One respondent counseled against leasing space to non-International Energy Agency countries out of concern that such lessees might have ulterior motives, and would attempt to make drawdown of the oil ineffective as a response to an emergency.

(continued on page 28)

U.S. Strategic Petroleum Reserve... (continued from page 27)

Respondents overwhelmingly favor the commercialization of underutilized facilities such as pipelines, provided that their function can be contracted for when needed. The industry responses noted the positive benefits to industry and the elimination of environmental disruptions by avoiding the construction of duplicate facilities for commercial use.

In both the facility and storage cases, respondents were overwhelmingly in favor of the Strategic Petroleum Reserve reducing its net costs by generating revenue from facilities.

Issue 7: Should the Reserve attempt to raise funds through alternative financing, innovative financial instruments, or buying and selling inventory?

The overwhelming response from corporations, institutions, and individuals was that the Government is ill equipped to enter into markets for high risk financial instruments such as options. The oil companies responding were very clear that buying and selling oil for the purpose of financial gain is not the business of the Strategic Petroleum Reserve, and should be avoided. Most respondents were silent on "leasing" or other contractual methods of controlling oil without taking an equity position in the oil.

Assessment of the Issues:

To a significant degree, the responses to the public comments tend to reinforce the current and traditional policies of the Government toward the Strategic Petroleum Reserve. The issue of whether to have a Reserve has not been seriously challenged within the Administration. Proponents of eliminating the Reserve as an unnecessary intrusion into open markets were not supported by the industry, the states or the public. Distribution of the oil via sales to the highest bidder was also thoroughly endorsed; there is no advocacy for an allocation system. The issue of drawdown and distribution capability was widely ignored in the responses, and treated as a technical matter rather than a policy issue. The Department views the value of the Reserve to be very closely tied to its drawdown and distribution capability, and has budgeted to restore the capabilities lost by the decommissioning of the Weeks Island site by enhancements at the other sites.

The Department was opposed to the last two sales of oil from the Reserve and is opposed to the sale of oil that is now required by appropriations bills currently being worked on in the Congress. The Director of the Office of Management and Budget has opposed a sale in FY 1998, and now the majority of respondents have said that the Reserve's inventory should be preserved for energy supply emergencies. Similarly, the Department has had recent successes in leasing and selling its off-reserve terminal and pipeline facilities. Industry and the public endorse putting underutilized facilities to work, and the recently enacted Balanced Budget Act provides specific authority for the storage of foreign strategic oil in the Reserve's unutilized caverns. At this time there does not appear to be any constituency for deviating from that policy.

Issues in Play

Of the seven issues that will be addressed in the Administration's Statement of Policy there are three issues that will occupy the attention of policy makers and which will have advocates for different options. In order of ascending importance they are:

Alternative financing: The Department has been looking

at ways of acquiring oil other than by direct purchase since 1990, but to date nothing has come of the limited initiatives. The use of options for both the purchase and sale of SPR has been advocated by various observers of the Reserve program over the years on theoretical grounds of efficiency. On the other side, critics point out the potential for losses and the negative impact that a financial failure of even very limited scope would have on the whole Reserve program. Because the public response to the use of financial derivatives of any type was so negative, there will probably be inertia to continue to acquire and sell oil by direct purchase and to seek to acquire oil by "leasing" or equivalent contractual means as is currently authorized by the Energy Policy and Conservation Act. Acquiring oil through the futures market does not have noticeable opposition, and will probably be further discussed.

Regional Refined Product Reserves: The Department is near to releasing a report on a study of the Northeast heating oil markets and the costs and potential benefits of creating a distillate reserve. All previous reviews of the regional issue were oriented toward the question of whether the Strategic Petroleum Reserve could offset a disruption of imports of refined products. The current study does not focus on import disruptions, but rather the benefits of a refined product reserve in the event of severe winter weather when inventories at the beginning of the weather event are insufficient to keep prices within a normal range, of price fluctuation. Based on the work that the Department has done, there is room to argue both sides of this issue. It is highly notable that the public did not pay much attention to this issue in its responses, and most notable that none of the Northeast state governments nor any individuals from New England responded to the Federal Register Notice solicitation for comments.

Reserve Size and Inventory: The current debate on this issue can be separated into three categories, economic, institutional, and global leadership. The last time that the Department formally looked at size options was in 1990 when it published its report *Strategic Petroleum Reserve Analysis of Size Options*. That analysis depended heavily on a deterministic cost benefit model that required assumptions about the likelihood of disruptions, offsetting production, and the negative impact that a petroleum price spike could be expected to have on the U.S. economy. That analysis concluded that economic analysis supported a Reserve of between 500-600 million barrels. The analysis also considered the national security aspects of the Reserve, and U.S. international leadership. Based on these less quantitative considerations, the Administration at that time endorsed a Reserve of 750 million barrels. In its current reassessment of size, the Department is looking at how supply, demand, price, and potential production offsets have actually tracked relative to the 1990 assumptions. We have also enlisted the Oak Ridge Research Associates to review academic work that suggests a stronger negative impact on the economy of petroleum price spikes than was used in the 1990 study. The Administration's policy makers will also consider the United States' leadership role among the International Energy Agency member countries in a new light. The Reserve has sold 28 million barrels of oil, U.S. private companies are reducing their inventories, and the U.S. precedent of selling oil for non-emergency purposes has spilled over to Germany, which

UK's Distribution Utilities Not Ready For Competition

By Fereidoon P. Sioshansi*

Everybody knew that preparing for competition was going to be complicated and expensive – particularly the systems required to keep track of customer accounts and billing. Now with the remaining 23 million customers in England and Wales expected to get a chance to pick their electric supplier over a 6 month period between April to September, 1998, new concerns have surfaced that suggest the task will be more complicated *and* far more expensive than originally estimated.

A few months ago, the Office of Electricity Regulation (OFFER) figured that the billing and accounting systems required to handle competition will cost some £154 million (approximately \$230 million) for the 12 regional electricity companies (RECs) and the two Scottish suppliers, Scottish Power and Hydro Electric (Table 1). OFFER figured that this *modest* cost could be recovered through an annual per-customer charge of £1 (approx. \$1.50) collected over 5 years. Given the fact that the average (residential) customer's bills run under £300 (approximately \$450), the surcharge was considered negligible.

Table 1
Cost of Competition
Millions of Pounds*

| Public Electricity Supplier (PES) | Original OFFER Estimate | Revised OFFER Estimate | Revised PES Estimate |
|-----------------------------------|-------------------------|------------------------|----------------------|
| Eastern | 15.00 | 26.25 - 29.45 | 43.10 |
| East Midlands | 12.00 | 20.69 - 33.61 | 80.18 |
| London | 11.50 | 18.91 - 30.40 | 55.17 |
| Manweb | 9.50 | 15.04 - 23.44 | 55.62 |
| Midlands | 12.00 | 20.58 - 33.41 | 67.45 |
| Northern | 9.50 | 15.11 - 23.57 | 31.43 |
| NORWEB | 12.00 | 19.93 - 32.25 | 118.53 |
| SEEBOARD | 11.50 | 19.26 - 29.76 | 77.24 |
| Southern | 13.50 | 23.35 - 30.44 | 41.62 |
| SWALEC | 8.00 | 12.19 - 18.30 | 67.52 |
| South Western | 9.50 | 15.18 - 22.17 | 34.96 |
| Yorkshire | 11.00 | 18.61 - 29.87 | 57.52 |
| Scottish Power | 11.00 | 18.86 - 30.31 | 71.74 |
| Hydro-Electric | 7.50 | 11.57 - 16.02 | 51.58 |
| Total | 153.50 | 255.50 - 383.00 | 853.70 |

Source: Offer report: *Opening the Market*

* Each £ is approximated US\$1.50

Now, with less than 7 months until April 1998, two new and significant issues have surfaced. First, it is generally acknowledged that only 3 of the 14 public electricity suppliers (PESs) will be ready for the last phase of open competition based on where they are today. Second, the cost of getting ready has ballooned to £854 million (approximately \$1.28 billion) – at least as figured by the 14 PESs.

OFFER has scoffed at these estimates, but even OFFER acknowledges that its original estimate was far off-target. OFFER now figures the cost of gearing up the customer information systems (CISc) for competition to be somewhere

* Fereidoon P. Sioshansi edits and publishes the *EEnergy Informer*, a monthly newsletter focused on the North American electric power industry. This is an edited version of the article which appeared in the August 1977 issue.

between £256–383 million (approximately \$380–575 million). That amounts to an annual per customer surcharge of £1.9–2.9 (approximately \$2.80–4.35) for 5 years. If the numbers end up being closer to what the companies estimate, then who will make-up the difference? Another question: if the costs are anywhere as large as the PESs estimate, then will there be any residual savings from competition? Professor Stephen Littlechild, Director General of OFFER insists that the savings from competition would still outweigh these costs, even though electricity supply (i.e., retailing in U.S. jargon), the portion of the service which is being opened to competition, accounts for just 6 per cent of the bills. Distribution (i.e., poles & wires), which remains a monopoly, covers 29 per cent of the bills, with the balance covering generation and other costs. And that's not all. The Electricity Pool, the wholesale power market, is spending £50m (approximately \$75m) to update its *own* computerized trading system.

One piece of the puzzle is the wide disparity in estimated cost of CIS upgrades among the PESs, e.g., Northern Electricity asking for £31m (approximately \$47m) while Norweb is requesting spending of £118m (approximately \$177m). Some of this may be due to size, density, customer diversity or other variables, but NORWEB's price tag stands out as an outlier no matter how you look at it (Table 1).

A more serious problem facing Professor Littlechild and John Battle, the new Minister of Energy, is that only Eastern, SEEBOARD, and Yorkshire appear to be anywhere ready to handle the competitive market come April 1998 based on system tests planned to begin in October 1997. The other 11 PESs are lagging anywhere from 3 to 4 months or more behind (Table 2).

Table 2
Who's Ready for Competition?

| | England and Wales | Scotland |
|---------------|---|--|
| 1997 October | Eastern, SEEBOARD, Yorkshire, the Pool | |
| 1997 November | SWALEC | |
| 1997 December | Northern, NORWEB, South Western, Hydro-Electric | |
| 1998 January | East Midlands, London Manweb, Midlands | Scottish Power Scottish Settlements |
| 1998 February | | |
| 1998 March | Southern | |

Source: *Progress on the 1998 Programme*, PA Consulting, May 1997; *Energy Utilities*, June 97.

In an editorial in *Energy Utilities* (June 97), Dieter Helm of Oxford Economic Research Associates (OXERA) says, "Professor Stephen Littlechild, Director General of Electricity Supply, has finally recognized two facts about the 1998 project to liberalize the electricity market. The first is that the costs of competition are likely to be much higher than he expected. His latest estimate is £255m–£385m over five years. The second is that the timetable for his three-phase program is hopelessly optimistic. Only three companies are now expected to be ready for the first trials." Helm goes further when he opines, "Nobody wants to admit publicly that the overall electricity project needs urgent surgery. Some slips in timetable and a bit more money may be OFFER's solution. Nevertheless, the fundamental problems will not go away. It is too early to predict with much confidence which 'event' will trigger the next set of timetable and cost revisions."

has already begun selling its 53 million barrel inventory of government owned crude oil. The United States has assumed a leadership role within the International Energy Agency advocating that free markets be allowed to work even in an emergency and that the first response to a disruption should be the release of strategic reserves. Our credibility in maintaining that advocacy role is a factor that policy makers will also weigh in reaching a position on this issue.

On the other side of the issue is the question of money. The Federal Government has added massively to the national debt since 1980, and it is a clear priority of the Administration and the current Congress to eliminate the deficit no later than FY 2002. After the deficit is eliminated, the critical question within the big picture of Federal Government activities is in what proportion surpluses will be assigned to national debt reduction, further tax relief, or increases in discretionary spending. Since the funds to acquire oil for the Reserve fall in this last category, the issue of SPR size and the timing of fill will compete not simply against a break even cost benefit analysis but against a queue of other programs that are philosophically acceptable to the Government and the American people but which have been shrunk or eliminated by the unrelenting budget pressures associated with elimination of the deficit.

Conclusion

The Department of Energy and the Administration have a target date of the end of September to release the Statement of Policy. That document will provide the basis for further amendments of the Energy Policy and Conservation Act that the Department of Energy hopes to champion during the next session of Congress, and for future budgets that will determine the direction of the Reserve's size and inventory.

Conference Proceedings 18th IAEE International Conference Washington, DC, July 5-8, 1995

The Proceedings from the 18th International Conference of the IAEE held in Washington, DC, are now available from IAEE Headquarters. Entitled *Into the Twenty-First Century: Harmonizing Energy Policy, Environment, and Sustainable Economic Growth*, the proceedings are available to members for \$55.95 and to non-members for \$75.95 (includes postage). Payment must be made in U.S. dollars with checks drawn on U.S. banks. To order copies, please complete the form below and mail together with your check to:

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ANNOUNCEMENT: LONDON WEEK

December 6-10 1997

SATURDAY 6 DECEMBER

Executive of EFCEE meets at midday. Full European-affiliate EFCEE/IAEE meeting at 15.00 at offices of Petroleos de Venezuela UK Ltd., 7 Old Park Lane, off Piccadilly at Hyde Park Corner (nearest station). Opposite the Hard Rock Cafe.

At 19.30 all attending are invited by BIEE to dinner at a nearby club. Details upon arrival.

SUNDAY 7 DECEMBER

BIEE Warwick Conference Administrators and invited EFCEE East European delegates transfer to Warwick University. (N.B. only those on these special groups have accommodation Sunday night).

MONDAY 8 DECEMBER

10.00-11.30: Registration for BIEE Conference at Warwick University (train London Euston to Coventry, then taxi 4 miles). Conference starts promptly at 11.30 with UK minister, John Battle's address. See separate announcement for further details of the Warwick Conference.

TUESDAY 9 DECEMBER

BIEE Warwick Conference finishes at 16.00.

WEDNESDAY 10 DECEMBER

Workshop on East European Energy, No.5. Commences at 09.30 at Shell-Mex House - Strand (courtesy of Shell UK). Working lunch. Finish around 16.00 pm.

Enquiries to: Mary Scanlan, Administrative Office, BIEE, 37 Woodville Gardens, Ealing, London, W5 2LL. Tel: +44-(0)181-997-3707. Fax: +44-(0)181-566-7674.

Climate After Kyoto - The Implications for Energy *Eleventh RIIA/IAEE/BIEE International Energy Conference*

Chatham House, London
5 and 6 February 1998

The aims of this conference, organized by the Royal Institute of International Affairs (RIIA), in association with the British Institute of Energy Economics (BIEE) and the IAEE, were printed in the Summer 1997 Newsletter - now we can advise you of the structure (subject to speaker invite).

Day 1

Session

1. Outcome of Kyoto summit on climate change
2. National Strategies for ratification/implementation, Part I: statements from the USA, the EU and Japan.
3. National Strategies, Part II: Russia - Eastern Europe - Developing Countries
4. Implications for Global Energy Markets:
Individual speakers on Coal-Oil-Gas-Non Fossil Fuels

Day 2

5. Evolution of Trading Systems and Enforcement Approaches.
6. Developing countries - AIJ/JI and Technology Transfer Initiatives.
7. Future work of the IPCC
8. Industry Strategies - Keynote Address and Final Panel.

Confirmed Speakers include: John Browne, Group CEO, British Petroleum Co. Plc; Dr Robert Watson, World Bank Environment Director; A Designated IPCC Chairman; and Michael Brown, Director of Cogen, Europe. Sponsorship is sought to support participation by developed countries, academics and non-governmental persons. For further information contact:

Diana Bailey, RIIA Conference Unit
Phone +44 (0) 171-957-5700; Fax: +44 (0) 171-957-5710

Publications List

Independent Power Producers in Asia, (1997). Price: \$650.00. Contact: FT Energy Asia Pacific, 159 Telok Ayer Street, Singapore 068614. Phone: 65-323-6373. Fax: 65-323-4725. E-mail: ppsing@singnet.com.sg

Electricity in Europe Towards The Year 2000, (1997). Price: \$195.00. Contact: UDI, 1200 G Street, NW, Ste. 250, Washington, DC 20005-3802. Phone: 202-942-8788. Fax: 202-942-8789.

1997 International Petroleum Encyclopedia, (1997). Price: \$150.00 publication / \$195.00 CD-ROM. Contact: PennWell Directories, 3050 Post Oak Blvd., #200, Houston, TX 77056-6524. Phone: 918-831-9555.

Directory of U.S. Cogeneration, Small Power & Industrial Power Plants. Price: \$395.00. Contact: Utility Data Institute, 1200 G Street, NW, Suite 250, Washington, DC 20005-3802. Phone: 202-942-8788. Fax: 202-942-8789.

Electrical World Director of Electric Power Producers. (105th edition). Price: \$395.00. Contact: Utility Data Institute, 1200 G Street, NW, Suite 250, Washington, DC 20005-3802. Phone: 202-942-8788. Fax: 202-942-8789.

International Directory of Electric Utilities (8th edition). Price: \$345.00. Contact: Utility Data Institute, 1200 G Street, NW, Suite 250, Washington, DC 20005-3802. Phone: 202-942-8788. Fax: 202-942-8789.

Measuring the Competition: Operating Cost Profiles for U.S. Investor-Owned Electric Utilities. Price: \$595.00. Contact: Utility Data Institute, 1200 G Street, NW, Suite 250, Washington, DC 20005-3802. Phone: 202-942-8788. Fax: 202-942-8789.

Electricity in South Asia. (1996). 182 pages. Price: \$616.00. Contact: FT Energy Publishing Asia Pacific, 159 Telok Ayer Street, Singapore 068614. Phone: 65-323-6373. Fax: 65-

323-4725. E-mail: ftenergy@pearson-pro.com.sg

Electricity in South-East Asia. (1996). 178 pages. Price: \$616.00. Contact: FT Energy Publishing Asia Pacific, 159 Telok Ayer Street, Singapore 068614. Phone: 65-323-6373. Fax: 65-323-4725. E-mail: ftenergy@pearson-pro.com.sg

Electricity in Southern Africa. (1996). 273 pages. Price: \$560.00. Contact: FT Energy Publishing Asia Pacific, 159 Telok Ayer Street, Singapore 068614. Phone: 65-323-6373. Fax: 65-323-4725. E-mail: ftenergy@pearson-pro.com.sg

Electricity in the Middle East. (1995). 172 pages. Price: \$560.00. Contact: FT Energy Publishing Asia Pacific, 159 Telok Ayer Street, Singapore 068614. Phone: 65-323-6373. Fax: 65-323-4725. E-mail: ftenergy@pearson-pro.com.sg

Calendar

11-12 November 1997, 16th Annual Pacific Coast Oil Show & Conference. Kern County Fair Grounds, Bakersfield, California. Contact: Pacific Coast Oil Show & Conference. Phone: 630-241-9873. Fax: 630-241-9870. URL: www.pacos.com

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.

13-14 November 1997, The Developing Energy Markets of Central & Eastern Europe. Renaissance Hotel, Prague. Contact: Business Seminars International, Ltd., Sussex House, High Street, Battle, East Sussex, TN33 0AL, United Kingdom. Phone: 44-171-490-3774. Fax: 44-1424-77-33-34.

19-21 November 1997, Expo Petroleo Colombia '97. Santafe de Bogota, Colombia. Contact: Fax: 301-493-5705.

20-21 November 1997, Natural Gas: Trade and Investment Opportunities in Russia and the CIS. Hotel Inter-Continental, London. Contact: Royal Institute of International Affairs, Chatham House, 10 St James's Square, London SW1Y 4LE, United Kingdom. Phone: 44-171-957-5700. Fax: 44-171-321-2045.

8-11 December 1997, The Fourth Asian-Pacific International Symposium on Combustion and Energy Utilization. Bangkok, Thailand. Contact: Energy Research Institute, Institute Building III, Chulalongkorn University, Bangkok, 10330, Thailand. E-mail: apisceu@eng.chula.ac.th

9 December 1997, Coal - A Vision for Tomorrow? New York, NY. Contact: The Energy Forum, City University Graduate Center, Rm. 1560G, 33 West 42nd Street, New York, NY 10036. Phone: 212-642-2381. Fax: 212-642-2642.

16-21 December 1997, The Second International Non-Renewable Energy Sources Congress. Kish Free Zone Island, Hormozgan, Iran. Contact: Ali Haghtalab, Congress Secretariat, e-mail: u10215@uicvm.uic.edu

(continued on page 32)

Future IAEE Events

Annual Conferences

| | |
|---------------------|--|
| May 13-16, 1998 | 21st IAEE International Conference Quebec, Canada <i>Chateau Frontenac Hotel</i> |
| October 18-21, 1998 | 19th Annual USAEE/IAEE North American Conference Albuquerque, NM, USA <i>Hyatt Regency Albuquerque</i> |
| June 9-12, 1999 | 22nd IAEE International Conference Rome, Italy <i>Hotel Parco dei Principi</i> |

Conference Proceedings 19th IAEE International Conference Budapest, Hungary, May 27-30, 1996

The Proceedings from the 19th International Conference of the IAEE held in Budapest, Hungary, are now available from IAEE Headquarters. Entitled *Global Energy Transitions, with Emphasis on the Last Five Years of the Century*, the proceedings are available to members for \$55.95 and to non-members for \$75.95 (includes postage). Payment must be made in U.S. dollars with checks drawn on U.S. banks. To order copies, please complete the form below and mail together with your check to:

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Calendar (continued from page 31)

12-23 January 1998, Third International Training Program on "Utility Regulation and Strategy." A Collaboration between the Public Utility Research Center and the World Bank. Gainesville, Florida, USA. Contact: Pascale Parker, Program Coordinator, PURC, 205 Matherly Hall, University of Florida, Gainesville, FL 32611. Phone: 352-392-3655. Fax: 352-392-7796. E-mail: purcecon@dale.cba.ufl.edu URL: <http://www.cba.ufl.edu/eco/purc/wrldbank.htm>

21 January 1998, Restructuring the Electricity Industry: The Real World. New York, NY. Contact: The Energy Forum, City University Graduate Center, Rm. 1560G, 33 West 42nd Street, New York, NY 10036. Phone: 212-642-2381. Fax: 212-642-2642.

10-12 February 1998, Global Energy Forum: The Energy Company of the Future, the 17th Annual CERA Executive Conference. Westin Galleria & Oaks, Houston, Texas. Contact: Michael Banville, Cambridge Energy Research Associates, 20 University Road, Cambridge, MA 02138. Phone: 617-497-6446. Fax: 617-497-0423. E-mail: mabanvill@ceracamb.com

4-6 March 1998, Centre for Global Energy Studies, Second Latin American Energy Conference. Inter-Continental Hotel, Miami, Florida, USA. **Gas, Power and Regulation in Latin America: From State Monopoly to Private Investment.** Contact: Phone: 44-171-704-6161. Fax: 44-171-704-8440

27-28 April 1998, Centre for Global Energy Studies, CGES Eighth Annual Conference. Inter-Continental Hotel, London, England. **Oil and Gas Investment in Asia: The Engine of Growth.** Contact: Phone: 44-171-704-6161. Fax: 44-171-704-8440

13-16 May 1998, 21st IAEE International Conference. Quebec City, Canada. Contact: IAEE Headquarters, 28790 Chagrin Blvd., Ste. 350, Cleveland, OH 44122. Phone: 216-464-5365. Fax: 216-464-2737. E-Mail: iaee@iaee.org URL: www.iaee.org

8-11 June 1998, 9th Global Warming International Confer-

ence & Expo. Hong Kong University of Science & Technology. Contact: Dr. Sinyan Shen, Chair, International Program Committee, Global Warming International Center, PO Box 5275, Woodridge, IL 60517. Phone: 630-910-1551. Fax: 630-910-1561.

14-18 June 1998, National Energy Conference CNE'98: Energy for Tomorrow - Reconciliation of Efficiency and Competitiveness with the Sustainable Development. Neptun, Romania. Contact: Mrs. Ella Ratcu, CNE'98 General Secretariat, 8 Energeticienilor Blvd., 79619 Bucharest 3, Romania. Phone: 401-321-4465. Fax: 401-321-1010. E-mail: srai@mail.gsci.vsat.ro

17-19 June 1998, EPRI's 1998 Innovative Approaches to Electricity Pricing Conference: Pricing in the Competitive Business Environment. Washington, DC, USA. Contact: Ms. Lori Adams, EPRI, 3412 Hillview Avenue, Palo Alto, CA 94304-1395. Phone: 415-855-8763. Fax: 415-855-2041.

13-18 September 1998, 17th Congress of the World Energy Council. Houston, Texas. Contact: United States Energy Association, 1620 Eye Street, N.W., Suite 1000, Washington, DC 20006. Phone: 202-331-0415. Fax: 202-331-0418. (<http://www.wec98congress.org>)

18-21 October 1998, USAEE/IAEE 19th North American Conference. "Technology's Critical Role in Energy & Environmental Markets." Albuquerque, New Mexico, USA. Contact: USAEE/IAEE Headquarters, 28790 Chagrin Blvd., Ste. 350, Cleveland, OH 44122. Phone: 216-464-2785. Fax: 216-464-2768. E-Mail: iaee@iaee.org URL: www.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. 350, Cleveland, OH 44122. Phone: 216-464-5365. Fax: 216-464-2737. E-Mail: iaee@iaee.org URL: www.iaee.org

IAEE Newsletter

Volume 6, Fall 1997

The *IAEE Newsletter* is published quarterly in February, May, August and November, by the Energy Economics Education Foundation for the IAEE membership. Items for publication and editorial inquiries should be addressed to the Editor at 28790 Chagrin Boulevard, Suite 350, Cleveland, OH 44122 USA. Phone: 216-464-5365; Fax: 216-464-2737. Deadline for copy is the 1st of the month preceding publication.

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