

IA INTERNATIONAL ASSOCIATION FOR ENERGY ECONOMICS
EE
Newsletter

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President's Message



In the first three months of 1997 I have had the opportunity to attend the 20th International Conference of the IAEE, in New Delhi and have spoken to four of our affiliate organizations. This was in addition to seven affiliates in 1996. These visits have given me a better understanding of the needs of these organizations and how we all work together in the IAEE.

The New Delhi Conference was very successful under the leadership of Dr.

R. K. Pachauri and the management of Dr. Lenna Srivastava who toiled long and hard to ensure an outstanding program and to get a very good attendance of outstanding people in the profession. A number of senior energy officials attended the conference including Secretary Vijay Kelkar, Ministry of Petroleum and Natural Gas and Shekhar Datta, President of the Confederation of Indian Industry. The topic *Energy and Economic Growth: Is Sustainable Growth Possible?* was particularly appropriate for India and other fast growing areas of South Asia and the Asia-Pacific since economic growth and infrastructure constraints have placed great challenges before governments and the energy industries to meet the needs of growing economies. The choices before these economies are often not perfect and require trade-offs which contribute to environmental problems in the region. I am not sure that we answered the question "Is Sustainable Growth Possible?" but we did contribute to a better understanding of the issue. We should all let Dr. Pachauri know of our appreciation for his effort.

I also had the opportunity to visit affiliates in Seoul, Tokyo, Taipei and Rome. I am pleased to report they are all doing very well and in the center of very exciting activities in their economies and region. In Seoul, the Korea Affiliate has 31 members who are actively working on issues related to energy supply and structure. In Taipei, the issues of privatization, deregulation and environment are very much in the center. Our affiliate members in Japan are looking at issues of deregulation as well as helping to develop the new APEC sponsored Asia-Pacific Energy Research Center

which promises to be a major new source of important information and analysis. In Rome, the membership of the AIEE is looking at many of the same issues and has now become the third largest affiliate of the IAEE. This has been the result of the leadership of Edgardo Curcio, a former executive of ENI, who has provided leadership and imagination to the growth and quality of this organization. In all of these economies the issues of growth, investment, privatization, deregulation, electricity, and environment are in the forefront as well as in many other economies.

As the IAEE grows and adds new members and affiliates we need to review our affiliate organizations and eliminate some of the confusion in names. I plan to place a motion on the agenda for the next official meeting of the Council in San Francisco, 7 September 1997, to reaffirm our policy of using the United Nations and APEC listing of countries as the formula for our listing of affiliates and editorial policies in all publications. I can't think of any better formula for an international organization than the UN or APEC. If you have any comments or questions relating to this issue please contact me on doibiaee@aol.com or fax me on 1-817-491-9866.

Our first Council Meeting in London, 19 January was

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Editor's Note

As Dennis O'Brien has mentioned, the New Delhi meeting was quite successful. We're fortunate in being able to include a number of the papers from the meeting as well as several other reports.

John Ferriter looks at the impact of globalization on policies affecting the energy industry with particular emphasis on the dynamic Asian economies, noting that energy, particularly oil, is an important part of the globalization process. He highlights the major lessons learned by the OECD countries over the last two decades in the hopes that these will be of relevance to the Asian economies. These

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EFCEE <i>European Foundation for Cooperation in Energy Economics</i>	IAEE <i>International Association for Energy Economics</i>	VEE <i>Verein für Energiewirtschaft und Energiepolitik (Austria)</i>
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The preparations are in full swing; the program is being finalized and invitations are going out. Enquiries for details are coming in, even from Japan. If you did not guess, it is about the forthcoming **Vienna Conference** at the:

Vienna Hilton Hotel

Vienna, Austria

2-4 July 1997

on

THE INTEGRATION OF CENTRAL EUROPEAN, BALTIC AND BALKAN COUNTRIES IN THE EUROPEAN ENERGY ECONOMY

Apart from the Opening Session there will be six plenary sessions:

The Economic Background
 Energy Pricing Policies in Eastern Europe
 Restructuring the Energy Economy of Transition Countries
 Two sessions on Privatization and Foreign Investment in Energy Networks
 The Functioning of a Pan-European Energy Market

The Conference goes beyond the academic aspects of these subjects and is followed on 4 July, 1997 by a **SPECIAL BUSINESS SEMINAR** which will give executives of Western energy corporations the opportunity to bring up the problems encountered doing business in Eastern Europe. In order to start useful dialogues, the 11 Ministers of Energy of the Eastern European Countries are being invited to be present or represented.

The basic fee is 4,500 ATS (around US\$450). Reduced hotel rates have been contracted with hotels in all categories. An attractive *Accompanying Persons Program* has been organized and at a low cost.

Add to all this that Vienna is a beautiful city and the Conference venue in early summer is really splendid. This East-West Conference holds high trump cards. Is it wise not to participate?

For more details and registration forms contact:

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quite successful. We agreed to support the July 2-4 meeting in Vienna which will focus on energy issues related to the Eastern Europe economies. In addition we are looking to reorganize the duties of the officers of the IAEE and will discuss that issue in an informal Council meeting in Vienna on 2 July 1997. In this meeting the Council will discuss some of the suggestions which have been made about the future of the Council on an information basis only. Any recommended actions will be brought forward to our San Francisco Council Meeting on 7 September. If you have any thoughts or comments I would urge you to be in contact with any of the Council members including myself either directly through their listings in the Membership Directory or through the IAEE Executive Director.

Another issue we will discuss is the renewal of our arrangements with Administrative Management Services

who have worked hard and very effectively in the administration and management of the IAEE and our conferences, Their contract is coming up for renewal and I have asked Tony Finizza to head a small panel to review our past relationship and to make recommendations to the Council about the future. I want to emphasize this is routine and an open process and it is designed to make our quality organization which is very good even better. We have made great strides in making the IAEE a quality organization during the last five years in our partnership with AMS and this review will help ensure that we continue on our path to be the best organization of professionals in the world. If you have any comments or questions please direct them to Tony Finizza directly at afinizz@aol.com or any of the Council members who will redirect them to this important committee.

In March, I attended the Asia-Pacific Energy Research Center's "Workshop on Methodologies and Data for Energy Demand/Supply Outlook" which brought together many

experts from the region and the world and included many prominent members of the IAEE. Keiichi Yokobori is the President of this new and important addition to our network of research centers around the world. Mr. Yokobori is a member of our distinguished IAEE Presidential Advisory Panel. Also in attendance were representatives of OLADE, FAO, ABARE, KEEI, IEA, the East-West Center, IIASA, and many other prestigious energy research centers.

Our next important event will be the North American USAEE/IAEE Conference in San Francisco, 7-10 September. Our meeting will be the last event in two exciting weeks of energy meetings in Western Canada and the United States. The Canadian Energy Research Institute and the PECC Energy Forum will host a two day business oriented Conference, *Energy Industry Forum for the APEC Economies* in Edmonton, Alberta on 24-25 August as an open meeting preliminary to the APEC Energy Ministers meeting hosted by Canada in Edmonton, 26-27 August which is a closed meeting. On 2-5 September, the PECC Energy Forum will hold a meeting, *Energy Infrastructure in the Asia Pacific* at the Fairmont Hotel in San Francisco just prior to the North American USAEE/IAEE on 7-10 September also at the Fairmont Hotel in San Francisco. You may obtain information on the first two conferences from Steve Burns at peccenergyforum@worldnet.att.net or 1-202-293-3995tel/1-202-293-1402fax. Many prominent global and Asia-Pacific energy leaders in the energy world will attend these events. You may wish to learn more about the fast changing energy world of the Asia-Pacific and these events will provide that opportunity. Please call me if you want to discuss any possible involvement in the first two meetings.

I mentioned in my last message the need to open the IAEE for new and younger member participation. Some of the Council members including myself are concerned when we do not get feedback on the IAEE and its programs from the general membership. E-mail and other forms of communication now make the job much easier and we welcome your interest and participation. The entire Council welcomes your thoughts and comments on our organization and the way we deal with energy issues. You can contact me directly at dobiaee@aol.com or through iaee@iaee.org. Other Council members can be reached through the latter E-mail address or directly through their membership directory listings.

Dennis O'Brien

Editor's Note (continued from page 1)

Lessons include the need to rely on market principles, the importance of supply security and deregulation and the steps governments need to take to create an attractive climate for energy investment and trade.

In a keynote address at the 20th International Meeting, R. K. Patchuri looked at the impact of the information revolution on the aspirations of the poor and highlighted the lack of policy and vision on what needs to be done to provide energy for them. He suggests what is needed are some new development paradigms.

Morten Frisch examines the West European gas supply/demand balance and notes that significant requirements for new supplies will not appear until after 2005. After this the Yamal-Europe pipeline project will begin to play an ever more important role. He outlines this project noting current

plans as well as possible additions to it and the part these will play in providing the gas Western Europe will need after 2005. He concludes by discussing the approaches to gas supply diversification in Central and Eastern Europe and making a comment on privatization.

Our regular contributor, Mamdouh Salameh, looks at the trends in United States' and China's oil import demand and the role the Middle East will play in satisfying this and concludes that this could lead to either a period of growth and interdependence in the world economy or to the collapse of the new political order in the Gulf, and instability and conflict in the Asia-Pacific region. He explores the reasons why and suggests some possible alternatives.

Katsuo Seiki notes that the pace of environmental technology transfer has been slower than expected, in spite of the general consensus on its importance. In answer to the question, what can be done to quicken the pace, he lists a number of initiatives. He then goes on to discuss the consensus that has been developing for effective technology transfer and concludes by proposing several areas of further study.

Isabel Gorst, in her response to receiving IAEE's 1996 Journalism Award, looks at her experience as an energy reporter in Moscow since 1991 and reviews the initial euphoria surrounding Russian energy to the subsequent disappointment five years later. She goes on to note some of the challenges that will face both the West and the FSU in achieving energy cooperation and foresees a time when Iran may emerge as an important export corridor for central Asian oil.

Shekhar Datta gives an industry perspective on the Indian electric power sector noting that the effects of the 1991 liberalization have been very disappointing. Instead of the abundant power that was supposed to come forth, a plethora of problems and controversies have sprung up. He cites some of these problems and makes some clear recommendations of needed changes by the government. He concludes with the hope that instead of more and more conferences on energy, the Indian government will act on some of the much needed issues.

Stephen Karekezi contrasts the industrial world's concern about the long-term environmental impact of current patterns of energy production and use with the African countries' immediate and pressing need for a minimum level of modern energy services and notes that Africa lacks a consensus as exists in industrial countries on alternative energy approaches. He goes on to look at the experience of the African Energy Policy Research Network in introducing energy efficiency and demand-side management issues in its research program and then reviews the important achievements and benefits of the Network. He concludes by noting some lessons from the Network's experience for other developing countries.

A. Bhattacharyya examines projected energy demand growth in the Asia-Pacific and notes the size of the energy infrastructure needed to provide this and the cost thereof. He goes on to quantify the gap between what the region can provide on its own and that which will be required from outside and notes that one way this gap can be closed is through the use of joint ventures as has been the case in India.

As always, we encourage submissions from the membership. Remember, this is your *Newsletter*.

DLW

Globalization: Challenges and Opportunities in Shaping a Common Future

By John P. Ferriter*

I am happy to help set the stage for this discussion on the challenges and opportunities offered by globalization, as all countries, in every stage of development, will face their own set of unique challenges from this process. Here, I will concentrate on the policy dimensions of globalization as viewed by the International Energy Agency (IEA). But first, let me give you a snapshot of the changing profile of the world energy landscape to the year 2010.

Energy Demand: Outlook To 2010

The IEA carefully tracks developments in world primary energy demand in the annual *1996 World Energy Outlook*. From the *1996 Outlook*, one can glean the main features of the energy landscape to the year 2010, specifically:

- World primary energy demand will climb 50 percent from 1993 to 2010 – continuing its steady growth as it has over the last two decades.
- We will continue to live in a fossil fuel world – 90 percent of global energy consumption today is fossil fuel and this will continue at 90 percent of world consumption through the year 2010.
- Oil will continue its dominance in this fossil fuel world – 40 percent of total world energy demand will be met with oil in 2010.
- Demand for solid fuels, principally coal, is expected to rise steadily in the outlook period to 2010 (at an average annual rate of 1.7 to 2.2 percent). Overall, the share of solid fuels in the primary fuel mix is likely to remain stable, but there will be significant changes in the pattern of world solid fuels consumption. Countries such as India and China are very coal intensive. Growth in coal demand in the non-OECD countries could be as high as 3.8 percent per annum, and use in power generation could be as high as 6 percent per annum. Of course, there will be environmental consequences to the fossil fuel dominated future. Energy-derived CO₂ emissions will be up 50 percent in 2010.
- A structural shift in the shares of different regions in world energy demand is likely and we could see the OECD share of world energy demand fall from around 55 percent in 1993, to less than 50 percent in 2010.
- A dramatic increase in demand is likely in the Dynamic Asian Regions – China, East Asia, and South Asia – whose share could double to more than 25 percent of world energy demand by 2010.
- The Dynamic Asian Regions (DAR) lead the world in contributions to incremental energy demand. The IEA *WEO* sees Asia accounting for 44 percent of world demand growth to 2010. South Asia alone will account for 11 percent of that figure.

Asian Oil Demand Import Dependence Continues To Rise

The oil demand of the DARs is expected to increase

* John P. Ferriter is Deputy Executive Director, International Energy Agency, Paris, France. This is an edited version of his remarks at the 20th IAEE International Conference, January 22-24, 1997 in New Delhi, India.

substantially up to 2010, with an average annual growth rate close to 5 percent. The DARs will then account for 42 percent of the increase in world demand for oil between 1993 and 2010.

Since their oil production is expected to be sluggish, their dependency on imported supplies is likely to increase. The DARs currently import around 40 percent of their oil consumption, a figure expected to grow to 65 percent in 2010, the bulk of it from the Middle East.

Globalization: Challenges and Opportunities

The two decades since the first oil shock have witnessed profound changes in the world economy. Globalization has been driven by growth in trade, growth in international investment, the expansion of financial markets, and the political integration of the East and the West. It makes the world economy more and more integrated.

Energy, especially oil, is an important part of the globalization process. In the globalized energy markets, owning resources remains a significant national asset; but creating conditions which permit their exploitation at reasonable cost is the real issue. Ownership, and deciding the desired pace of exploitation, are matters for sovereign national decision; realizing those decisions depends on moving with the flow of international markets. Mobilizing the international capital and technology of the energy consuming countries may be necessary to achieve exploration, development and production goals.

Globalization

Features common to both energy and the economy are:

1. *Growth in trade:* Since World War II, and especially during periods of high growth, trade has grown much faster than output generally – over the past ten years on average twice as fast.
2. *Growth in international investment:* International investment has grown even faster than trade; in fact foreign direct investment has grown four times faster than trade or ten times faster than output since 1983.
3. *Growth in financial markets:* Money markets have grown faster than trade, investment or output.
4. *Shift in output and consumption:* But perhaps the most important phenomenon is a shift in the world's center of gravity and the growing importance of non-OECD economies.
5. *Political integration:* An even wider phenomenon is the new post-Cold War world order – an international environment where economies in transition and other formerly nonmarket economies are rapidly integrating themselves into world political and economic structures.

Structural Reform

Structural reform covers a number of different developments, including:

1. *Privatization*
2. *Increasing competition*
3. *De-monopolization:* Particularly to unbundle monopoly and competitive activities.
4. *Deregulation:* Covering both the removal of regulations and the reassessment of regulatory methods in areas where regulation remains appropriate. Regulatory reform is itself part of a wider phenomenon – the drawing back by

governments from direct intervention in markets.

Policy Issues Emerging From Globalization

A number of questions spring to mind, particularly regarding the role of governments. Where will the money come from to finance massive investments needed in the energy sector? What fuel sources are to be used in meeting demand for energy? And from where are they going to be extracted and traded? How can energy security and environmental sustainability for Asia be achieved? If these questions seem familiar to you, it may be because they are the same questions that IEA countries have been wrestling with over the past two decades. I hope that other countries and, in particular, the dynamic economies of Asia, will be able to benefit from our experience in these areas and avoid repeating our mistakes.

Let me highlight here what we believe have been the major lessons for us over the past 22 years, which may be of relevance to the dynamic Asian economies.

Market Principles

Efficient use of energy and development of the energy sector depend on sound energy policies based on market principles. More transparent and open markets – with undistorted pricing, together with other steps to encourage diversity, efficiency and flexibility within their energy sectors – enhance their functioning, particularly in times of uncertainty.

The challenge for energy policy in the 1990s is how to best safeguard energy security and to meet environmental goals in the open and competitive markets increasingly being established in response to global economic integration. The energy industry has been responding to the challenges and opportunities of globalization by strategic restructuring to maximize competitiveness and to internationalize activities.

Governments are increasingly withdrawing from direct involvement in the market, whether through ownership of operating companies or through direct regulation. Market forces alone, however, cannot secure either energy security or a clean environment. The role of government is to facilitate commercial activities, rather than replace them.

Supply Security

We still have a fossil fuel future for as long as we can foresee. Most Asian countries will become increasingly dependent on imported oil in the next 15 years, and the major source of supply of that oil will be a small number of countries in the politically fragile Middle East.

Rising oil imports remains a key concern demanding strong security of supply and emergency response policies. Before 1992, oil imports primarily came from Asia-Pacific nations – with Indonesia, Malaysia, and Australia accounting for more than 50 percent of its total crude imports. But, this situation has begun to shift, and in 1993 the volume of crude imports from the Middle East exceeded the flow from Asia for the first time.

Oil supply security is a global issue and non-OECD countries should be encouraged to take their share of protecting against future oil supply disruption by holding emergency stocks. This applies particularly to those countries, which are seen to have a growing dependence on oil imports, notably in Asia.

Another important step to improve security is to slow the rate of oil demand growth. This can be done by a combination of greater efficiency of energy use and increased substitution by other energy sources, particularly natural gas.

The oil sector's deregulation can be considered one of the measures to enhance oil supply security.

Supply diversity adds to oil security. Indeed, it is the increasing dependence on one geographic area, the Middle East, which is of prime concern in the longer term outlook.

Investment

Capital availability is important, but the attractiveness of the terms and conditions of individual projects is even more important. Transboundary capital flows have increased significantly with globalization. In fact, capital markets have become competitive in their own right. Capital will go where it gets the best return at acceptable risk.

It remains the role of government to create an atmosphere where capital markets can function competitively and efficiently. Governments should pursue macroeconomic reforms, restructure energy industries, and end subsidies and price controls, to help build a domestic market based on sound economic principles. Reforms are not merely a matter of opening the market to private and foreign investors and providing them with a package of incentives in a particular sector, it involves changing the way by which the whole system is working.

Private investors today have a wide choice of where to put their money. What will make them choose India instead of, say, Latin America? What sort of investment climate do Indian policymakers need to create in order to attract the capital for required projects? Let me mention a few of the most important elements that Indian (indeed all) governments should strive to provide:

1. Ensure general macroeconomic reforms that promote stability and growth throughout the economy. Not only will economic stability attract investment, but the economic growth it promotes will increase the demand for energy, in turn making investments in the energy sector more attractive.
 2. Redefine their role from energy provider to energy regulator. To do this, they need to create strong legal and regulatory systems.
 3. Establish a good track record of enforcing contracts and regulations, and of not arbitrarily changing them.
 4. Create a level playing field by eliminating special favors to government-owned or domestic companies to the detriment of private or foreign ones. This should apply, for example, with respect to access to infrastructure, and to taxes and subsidies.
 5. Reduce and eventually eliminate subsidies and price controls that distort the market and make it difficult for investors to get a good return on their investments. In any case, it is more efficient for governments to address social needs directly.
 6. Enact favorable tax regimes, including reasonable depreciation allowances and low import tariffs on equipment;
 7. Ensure transparency of legislation so that investors may more easily compare investment regimes across countries.
- There is also a need for transparency in practices, specifi-

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Globalization: Challenges....(continued from page 5)

- cally the elimination of corruption.
8. Eliminate currency restrictions that make it difficult for companies to gain access to foreign capital markets and difficult for foreign companies to repatriate profits.
 9. Improve physical infrastructure affecting the energy industry, such as road and rail transportation.
 10. Ensure favorable conditions for energy trade, both within and between countries. Investors will need to see that they can sell their product.

Creating an attractive climate for investment and trade is one of the most important ways to ensure energy security.

Environment

One factor that will significantly affect future energy demand and investment in the industry is growing concern about the effect that energy use has on the environment. This encompasses both local and global pollution – particularly the greenhouse effect. By 2010, world carbon emissions could be between 30 and 42 percent higher than in 1990. Most of the growth in CO₂ emissions will occur outside the OECD area, and by 2010 the OECD could account for only 40 percent of the world's energy-related carbon emissions.

Only by close cooperation between government and the private sector and careful analysis of experience in other countries can the most cost-effective solutions to these problems be found, while achieving the desired environmental goals with the least impact on economic growth and industrial competitiveness.

An Overview of the International Energy Agency

For those who may not know the IEA, let me say a few words about the Agency. The IEA was created in 1974, in response to the first oil shock to ensure its members' collective energy security. At that time, the essence of energy security was seen as an uninterrupted oil supply.

Attention focused on developing emergency preparedness measures to respond to a major disruption in the international flow of crude oil, and on promoting long-term cooperation and research and development activities among members to reduce their dependence on imported oil.

While these activities continue today as fundamental elements of the Agency's work, events of the last several years, in particular the end of the Cold War, have dramatically altered the world political and economic scene, and thus changed the basic environment in which world energy markets function.

Principal among these changes is the growing importance of non-IEA countries as energy consumers. Non-IEA countries account for an increasingly important part of global energy demand. They will also be of increasing significance in global energy related environmental issues. In recognition of this evolving situation, the IEA has been expanding its global outreach. Our activities with Non-Member Countries (NMCs) have intensified in recent years and will continue to do so in the years to come. The goal of these activities is to assist NMCs in developing energy strategies and adopting energy policies that will contribute to their economic development and enhance global energy security. We are now considering new forms of cooperation between the IEA and major energy players which are not candidates for member-

ship, such as India.

Conclusions

Energy is an important part of the globalization process. Government's should pursue structural reforms to promote market liberalization. These reforms should include:

- Building transparent and open markets;
- Increased competition; and
- Regulatory reform.

The role of government is changing: There is less direct intervention; competition has increased; and regulatory reforms are underway.

Security of supply remains of concern. We should remember that energy efficiency improvements that reduce import dependence compliment a successful energy security policy.

We must break the pattern of energy intensity in IEA and developing countries to allow the benefits of a modern economy to be enjoyed by all. Resource and environmental constraints will not allow energy intensity at current OECD levels, for example in India or China, when these countries achieve equal levels of per capita economic activity.

A stable and open investment regime is critical; environmental concerns are increasingly important.

An efficient energy sector is a critical factor for any nation to remain competitive in the globalized economy. Finding the right balance in this crucial task is the principal challenge that, if realized, can offer the greatest opportunities for any nation, developed and developing alike.

Noteworthy

Campbell Watkins has been appointed chair of the American Statistical Association's Energy Statistics Committee. The Committee advises, among other organizations, the Energy Information Administration of the U.S. Department of Energy. Watkins is a past president of the IAEE and a Principal at the Law & Economics Consulting Group. In November of last year he delivered the Malavlya Memorial Lecture in New Delhi at the invitation of the Oil and Natural Gas Corporation of India. The title of his lecture was *Windows on Oil Exploration: The Estimation of Oil Supply Functions*.

Note: Members are encouraged to let the Newsletter know of changes in their position and/or honors received.

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Edith Penrose

Editor's note: The passing of Edith Penrose was noted in the Winter issue of the Newsletter. Campbell Watkins adds these comments:

Perhaps the recent merger and strategic alliance activity in the petroleum industry will again direct attention to her seminal work, *The Theory of the Growth of the Firm* and to her book, *The Large International Firm in Developing Countries: The International Oil Industry*. To mark these publications and other oeuvres, Edith received the IAEE's award for Outstanding Contributions to the Profession. It was presented at the Calgary conference in 1987. Many will recall her vigorous address, looking at the price of oil and what surprises might be in store for the prophets (published in *The Energy Journal*, Volume 9, No. 1, January, 1988).

She was a frequent attendee at IAEE events. Her chairing of sessions was a lesson in the virtues of a forthright approach. Woe betide the vague or long-winded questioner or a sloppy responder – intervention by the chair would be brisk and pointed. If I recollect correctly, she was on Fereidun Fesharaki's Ph.D. dissertation committee. I think Fereidun could still conjure up a sweat at the prospect of facing her incisive review of his screed.

She was a fine companion at dinner – lively and entertaining. The last time I saw her – at the Tours conference in 1992 – she was still very sprightly and sharp. She will be sorely missed.

Campbell Watkins

Scenes from the IAEE New Delhi Conference



Left to right, Leena Srivastava, R. K. Pachuari and Dennis O'Brien discuss IAEE Affiliate leadership matters.



Isabel Gorst, winner of the 1996 IAEE Journalism Award, chats with Kenichi Matsui, IAEE past president.

Report of the 1997 Annual General Membership Meeting and the Year 1996

President Dennis O'Brien called the meeting to order at 5:40 pm, January 23, 1997 at the Hotel Taj Palace Intercontinental, New Delhi, India and introduced Council members present. He then outlined several IAEE activities that would be developed in the near future. These included:

- Workshops focused on regional energy issues.
- Expanding the *Newsletter* to include a series focused on specific energy topics in each issue.
- Expansion of the Association's internet website to include articles from *The Energy Journal*.
- Additional support for Affiliates by Council/Headquarters. A survey of Affiliates on this subject would be made shortly.
- Further consideration of a foundation through which the Association's funds could be used more productively.

Executive Director David Williams reported that membership was continuing to grow at a rate of approximately 4 percent a year and currently totaled just short of 3300.

Williams also reported that 1996 had been another good year for the Association as a result of the very successful International Conference held in Budapest in May and the North American Conference held in Boston, MA in late October.

Subsequent to the meeting he provided the following income and expense report for the year and balance sheet for the end of the year:

1996 Statement of Income and Expense

Income		Expenses	
Dues	\$140,000	Admin. & Office Oprs.	\$99,000
Meetings	40,000	Publications	110,000
Publications	96,000	Other	21,000
Interest	24,000	Total	\$230,000
Other	18,000		
Total	\$318,000	Net Income	\$88,000

December 31, 1996 Balance Sheet

Assets		Liabilities & Fund Balance	
Cash & Equivalents	\$512,000	Accounts Payable	\$5,000
Accounts Receivable	33,000	Deferred Dues & Subscriptions	70,000
Total	\$545,000	Total	\$75,000
		Fund Balance	470,000
		Total	\$545,000

O'Brien noted coming International Conferences in Quebec City, Canada in May 1998 and Rome, Italy in June 1999 and that consideration was being given to Seoul, Korea for the 2000 meeting.

Attention was also called to the coming Vienna, Austria conference scheduled for July 2-4, 1997 and the North American Conference in San Francisco, CA, September 7-10.

The meeting was adjourned at approximately 6:40 pm.

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An Industry Perspective on the Indian Energy Situation

By Shekhar Datta*

We in the Confederation of Indian Industry (CII), have recently organized a two-day International Conference on Energy Policy, and I would like to bring out the key suggestions which emerged from that Conference.

Policy for Private Power

The liberalization of this sector in 1991 was expected to bring in high efficiencies and abundant power to the power starved Indian consumers. Instead, the privatization of the sector has brought in a plethora of problems and controversies. After nearly five years, only about 400 mw has been added to the country's generating capacity by the private sector.

CII has been interacting with the Ministry of Power on this subject, at different fora, in the past few months, and have suggested some solutions which could mitigate the difficulties experienced by potential investors.

The policy for private investment has got to be effective, pragmatic, and above all, transparent. Delays take place because policies are not transparent and negotiations are required on many aspects of energy projects. We need norms, for example, in the determination of power projects on the basis of "price of power." We are still to see a much needed transparency!

Fast Track Projects

Although a lot has been said about the *fast track projects* and the counter guarantees being given to them, even after so many years only the projects of Enron, Cogentrix and GVK Industries have actually got the counter guarantee. There is an urgent need for these fast track projects to actually be put on a "fast track." The Finance Ministry of the Government of India, needs to review its role in the decisionmaking process.

Institutional Reforms in SEBs

In today's scenario, the SEB reforms are central to private power. Although Orissa has already gone ahead with the "restructuring process," and a few other states are moving toward it, the pace seems to be agonizingly slow. It is essential that these reforms encourage competition, improve physical and financial performance of existing assets, and attract private investment.

Independent Regulatory Authority

Establishment of an Independent Regulatory Authority overseeing licensing/tariff/interregional transmission and environmental issues, is now a crying need, and it is imperative that appropriate measures are taken in this regard.

Fuel

Energy, needs to be looked at in totality, and not in segments and compartments. A matching fuel policy, for the

*Shekhar Datta is President of the Confederation of Indian Industry. This is an edited version of his remarks at the 20th IAEE International Conference, January 22-24, 1997 in New Delhi, India.

power sector would have to be outlined to facilitate the creation of fuel linkages.

Domestic supplies of primary fuels like coal, lignite, and other liquid fuels, would not be adequate for setting up the required capacity. There is a need to have an "import policy" for these fuels.

Also, the foreign exchange implications for power generation, based on imported fuel, would need to be looked into.

Deployment of off-shore natural gas from countries such as Oman, etc. is still debatable and doubtful. On the contrary, use of LNG imported through special tankers from countries such as Malaysia to support power generation in the Western Region needs to be critically evaluated.

Hydro resources of India needs to be supplemented with the hydro resources of Nepal and Bhutan. In this regard the involvement of multilateral agencies for developing such projects must be pursued on the highest priority.

Captive Mining of Coal

Exploitation of coal as a major fuel for generating power would require a massive investment. It is estimated that by 2005, we may require additional capacity at 70,000 mw, which would mean a requirement of an additional 280 million tonnes of coal. Using an approximation of Rs 250 crore/million tonne, this would mean an investment of Rs 70,000 crores.

If coal reserves have to be expeditiously and efficiently exploited, private sector mining should be permitted, regardless of whether the developer has a power project or not.

Energy Pricing

The energy supply system of the country, particularly the power sector, is facing enormous problems in the form of negative internal financial resources, on account of *irrational* pricing structures and subsidization of energy prices.

The existing energy prices do not reflect the true cost of supplying energy to the end user, and this process of cross subsidization of energy pricing, results in gross inefficiencies in the energy sector, with industry bearing the brunt. There is an immediate need for integrated energy pricing for optimum utilization of energy resources.

Environment

CII is concerned, both about energy and environment. This is why, in CII, we have two strong staff teams, focusing on energy management, and environment management and encouraging industry to conserve energy, and adopt environment-friendly manufacturing practices and technology.

Therefore, whatever we do in energy, we must be conscious of environmental concerns and issues, and safeguard these.

Technology and R&D

A key issue relating to conservation, or environment, or additional capacities, or increasing production, is technology. Today, we need to harness advanced technologies to meet our needs in India, and these technologies are either available here or outside the country. Technology is a factor not to be overlooked.

Whether it is coal or oil or power, one very important
(continued on page 12)

!!! MARK YOUR CALENDARS — PLAN TO ATTEND !!!

International Markets and National Policies

18th USAEE/IAEE Annual North American Conference - September 7 - 10, 1997
San Francisco, California, USA - Fairmont Hotel

Sponsored by:
USAEE/IAEE

If you're concerned about the future of the energy industry and profession, this is one meeting you surely don't want to miss. The 18th USAEE/IAEE Annual North American Conference will detail current developments within the energy field so that you come away with a better sense of energy supply, demand and price. Some of the major conference themes and topics are as follows:

Energy and International Security

- Short-term Disruptions: Prospects and Policies
- Long-run Transitions and Economic Security

Energy and Environmental Issues

- Quantifying Environmental Externalities
- Carbon-cycle Policies

Creating and Restructuring Energy Markets

- Electricity Market Restructuring
- Evolving Natural Gas Markets

International Trade

- International Energy Markets and Institutions
- Pacific Basin Energy Issues

Energy System and Economic Outlook

- Pacific Basin & North America

In addition, approximately 28 concurrent sessions are planned to address timely topics that affect all of us specializing in the field of energy economics.

Companies today are investing and trading in intensively competitive international energy markets. How these market conditions develop and what kinds of opportunities they create depend very much on the policies governments adopt, not only for promoting competition but also for meeting certain societal goals such as environmental protection. Since markets transcend national boundaries, policies adopted in one country or region may affect competition elsewhere as well as domestically.

The 18th USAEE/IAEE Annual North American Conference provides a unique opportunity for leading experts from business, government, universities, and research institutions to discuss and debate the future of energy markets in this era of commodization, decentralization, and internationalization.

The meeting will emphasize the applicability of the most recent, cutting-edge analysis for helping private and public organizations frame decisions and choose appropriate strategies. As a gateway to the Pacific Basin, San Francisco provides an ideal venue for discussing these issues.

In the past, USAEE/IAEE conferences have attracted outstanding speakers. Below please find a listing of some of the influential individuals who have attended and addressed this important conference.

Mike Bowlin, CEO, ARCO

John-Pierce Ferriter, Deputy Exec. Dir., IEA

Peter Gaffney, Sr. Partner, Gaffney, Cline & Assoc.

Hazel O'Leary, Secretary of Energy, U.S. DOE

Dr. Subroto, Former Secretary General of OPEC

Alfred Kahn, Special Cnslt., Nat'l Econ. Research Associates

Nordine Ait-Laoussine, President, NALCOSA

Herman Franssen, Ministry of Petro. & Min., Oman

Riwani Lukman, Secretary General, OPEC

Alirio Parra, Sr. Advisor, Ctr. for Global Energy Studies

Robert Wilhelm, Sr. Vice President, Exxon Corp.

Daniel Yergin, Pres., Cambridge Energy Research Associates

You can be sure that prominent speakers who are on the cutting-edge of energy economic issues will once again address this annual meeting.

San Francisco, California is a wonderful and scenic place to meet. Single nights at the Fairmont Hotel are \$167.00 (contact the Fairmont Hotel at 415-772-5147, to make your reservations). Conference registration fees are \$450.00 for USAEE/IAEE members and \$550.00 for non-members. Special airfares have been arranged through Traveline (for absolutely the lowest zone fares, call Traveline at - 216-646-8525). These prices make it affordable for you to attend a conference that will keep you abreast of the issues that are now being addressed on the energy frontier.

There are many ways you and your organization may become involved with this important conference. You may wish to attend for your own professional benefit, your company may wish to become a sponsor or exhibitor at the meeting whereby it would receive broad recognition or you may wish to submit a paper to be considered as a presenter at the meeting. For further information on these opportunities, please fill out the form below and return to USAEE/IAEE Headquarters.

International Markets and National Policies

18th Annual North American Conference of the USAEE/IAEE

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West European Gas Supply/Demand Balance

By Morten Frisch*

When addressing convergence issues related to natural gas in Eastern Europe it is necessary to set the scene by presenting the West European gas supply/demand environment. There are two reasons for this. First, the West European gas market with its strong currencies is currently the driving force for all European gas markets. Second, large quantities of natural gas transit Eastern Europe on its way to final markets in the west.

Gas Demands in Continental Western Europe

Consumption in continental Western Europe increased by some 6 percent in 1995 to reach approximately 300 BCM. This demand growth represented a combination of underlying growth and weather related demand increases. Continental West European consumption is expected to reach some 400 BCM by 2005 and a consensus view of the industry is that demand will continue to grow to about 620 BCM by 2015 including the United Kingdom and Ireland which are likely to have become consumers of Russian gas, either directly or indirectly at this point in time. All the above demand numbers are presented in Russian gas units of gross calorific value 11 kWh per normal cubic meter.

Gas Supply and Demand Balancing

Comparing continental West European gas demand with potential indigenous production and contracted imports, the need for additional gas supplies into this geographic area can be seen. However, the countries in this market area, with the exception of Denmark, are likely to have balance between gas supply and demand until the year 2005 and significant requirements for new gas supplies will only appear after this year. The possibility to penetrate this market area with new supplies in the near term does, however, exist. Large industrial consumers and local distribution companies will be keen to buy gas directly from import sources provided the price is right and transportation from the point of import to the plant or city gate can be arranged. Additionally countries like Italy, France, Spain and in the future, Portugal, are likely to contract for new supplies from nontraditional supply sources in order to achieve a better supply diversification. It is also likely that some of the traditional gas producers/importers in continental Western Europe will buy additional volumes of gas in order to include such volumes in sales to Eastern European gas utilities.

Continental West European Pricing

Only limited requirements for gas supplies exist in continental Western Europe prior to the year 2005. Ample gas supplies are available from numerous sources. Russia is very active in the market place trying to place large new volumes. Norway would like to bring an additional 20 BCM/Y to the market soon after the year 2000. Algeria will be in a position to increase gas exports mainly to Mediterranean markets by more than 25 BCM/Y from the year 2000. Algeria will be in a position to increase gas exports mainly to

*Morten Frisch is head of Morten Frisch Consulting, Surrey, England. This article is based on his talk to the East European Workshop, 9 December, 1996 in London, England.

Mediterranean markets by more than 25 BCM/Y from the year 2000. UK producers and gas distribution companies are likely to have signed gas export contracts with continental European buyers totaling some 15 BCM/Y by early 1997. Libya would like to build a pipeline to Italy and initially sell some 10 BCM/Y. In addition to the above traditional European gas suppliers, a number of LNG producers are showing an increasing interest in the European gas market. Nigeria LNG now has some 4 BCM/Y of LNG available for early delivery since ENEL of Italy has broken its long term gas supply agreement with this supplier. Other potential distant LNG supply sources for the European market are Egypt, Oman, Abu Dhabi, Qatar and Trinidad and Tobago. Strong competition for a share of the continental West European Gas market between the above mentioned pipeline and LNG suppliers is already evident.

Current import pricing in the reference German market for 90 percent Take or Pay and 110 percent DCQ swing contracts ("90/110 contracts") is in the range 1.4 to 1.5 Pf/kWh. Norwegian and Russian import prices at delivery points on the German coast or the border with the Czech Republic fall into this price category. However, these price levels are now being eroded by import deals made between UK producers and German and Dutch gas transmission and distribution companies. To date only Conoco and British Gas have executed gas supply agreements for the export of a total of 3 BCM/Y from the UK through the Interconnector. Both companies have signed contracts with WINGAS of Germany. Based on reports in the UK gas industry, these contracts would have a value of some 1.3 Pf/kWh in 4th quarter 1996 at Aachen on the Belgian/German border. It is understood that some 6 to 8 BCM/Y of UK gas is in the final stages of negotiations for delivery exit Zeebrugge in Belgium, mainly to Dutch buyers. Prices being discussed for these contracts are reportedly even keener than those which WINGAS has achieved.

Gasunie of Holland is currently conducting price review negotiations with its export customers. All prices for Norwegian gas deliveries to traditional German gas import companies will be subject to a price review effective from 1 April 1998. Based on the UK Interconnector deals mentioned above and also strong Russian pressure to increase gas sales to the German market, it is expected that Dutch and Norwegian prices will be adjusted downwards in relation to competing fuels after 1 April 1998, if not earlier. The prices in Russian contracts with German importers are also likely to be adjusted down in relation to competing fuels after 1998, if not before. The value of gas imported by WINGAS from the UK suppliers at Aachen is, therefore, more representative, on a real basis, of the future continental West European price level, than the prices paid by this market for current deliveries from Norway, Holland and Russia.

It is likely that nominal gas prices will increase in the German market. The reason for this is the weakening of the Deutsche Mark in relation to U.S. dollars and increases in crude oil values, both factors which will lead to higher gasoil and heavy fuel oil prices in the German market when expressed in the local currency. German natural gas import prices are traditionally tied to the inland value of gasoil and heavy fuel oil in that country. It is expected that the coupling between natural gas import prices and the price of these

petroleum products will weaken in the German market and, therefore, in the whole of continental Europe as has already been observed in Great Britain. The result of this development is that an increased share of the economic rent generated from gas production will be collected by the gas consuming country. The visible effect of this will be a move towards cost plus pricing by gas producers, a development which will favor the economically more robust gas projects with low transmission costs to the markets. This development, therefore, also signals reduced transit fees and transmission tariffs for countries providing transit of gas to Western Europe.

Impact of the Yamal-Europe Pipeline Project

The Yamal pipeline project should be viewed in two separate phases: first, the construction of new gas pipeline infrastructure from West Siberia to European markets and, second, the development of the huge gas reserves on the Yamal Peninsula.

Based on the available data it is unlikely that Russia will need to start gas production from the Yamal Peninsula before the year 2010. This is based on Russian gas demand, which is unlikely to exceed 1990 levels before 2010, and the availability of untapped gas reserves in the Nadym-Pur-Taz region of Western Siberia, more commonly known as the Yamburg and Urengoy gas area. If this West Siberian gas area should prove inadequate for Russia's domestic and export gas requirements prior to 2010, the best alternative sources would be gas from Turkmenistan and Kazakhstan. These gas producers are in a much better position to compete on price in European markets than gas from new billion dollar developments on the Yamal Peninsula. Gas from these two countries could be made available to European markets through existing pipeline systems which, admittedly, would need extensive refurbishment. Gas export solutions based on Turkmenistan and Kazakhstan would also require some very delicate diplomacy.

The Yamal pipeline project as currently planned by GazProm will consist of three 56" pipelines running from Yamal to Torzhok, north of Moscow. Two 56" pipelines will run from Torzhok to the Polish/German border at Frankfurt am Oder. In Germany there are two 48" pipelines planned, one of 700 km length to Aachen/Eynatten at the German/Belgian border (the WEDAL pipeline) and one of approximately 1000 km via Bavaria in the direction of Basel (the JAGAL pipeline). A total of 52 BCM/Y of gas will be available for sale at Frankfurt am Oder, while 14 BCM/Y is planned for consumption in Poland and 7 BCM/Y is planned to be delivered to Belarus. In addition to these sales volumes a total of some 10 BCM/Y will be consumed as compressor fuel along the Yamal pipeline system, making this ultimately a 83 BCM/Y gas export project.

The Yamal pipeline's crossing of the Oder River from Poland to Germany has been completed and construction is under way for sections of the JAGAL and WEDAL pipelines in Germany. The Polish section of the pipeline project will be owned by the Russian, Polish and German joint venture EuRoPol GAZ Company and operated by the Polish Oil and Gas Company. Construction of one of the two 665 kilometer pipelines needed for this section of the project has started. It has been reported in the press that EuRoPol GAZ Company has now secured financing for the total Polish investment. According to current plans the two Polish pipelines should be

completed by year 2004 with full compression capacity added by 2010, at which time the pipeline system can receive in excess of 66 BCM/Y at the border between Poland and Belarus.

Sections of the German and Polish parts of the Yamal pipeline project are already in operation and small "Yamal" volumes of gas started flowing to gas consumers in Germany on 1 October 1996. The availability of new transportation capacity from Torzhok to the Polish border is however uncertain. Although an inauguration ceremony has been conducted for the Belarus section of the pipeline system, no financing is yet in place for this part of the project which has been delayed for at least one year.

Yamal Gas Volumes in the European Market

In 2010 when the Yamal project is due to be fully operational this project could supply 10 percent of West European projected gas demand. To date only two contracts for the purchase of Yamal gas have been entered into. WINGAS of Germany has bought 10 BCM/Y and 0.6 BCM/Y is planned to be delivered under this contract already in the 1996/97 contract year. Gasunie of Holland has bought a further 4 BCM/Y with deliveries starting in 2001.

When discussing the marketing of Yamal gas with Russian and German participants in the project it is stressed that a large part of the capacity in this new pipeline system will be used for gas sales contracts currently being supplied through the Ukraine, Czech and Slovak republics. This is explained on the basis that additional gas transportation capacity is needed in South Eastern Europe and that the northern route represented by the Yamal project will therefore free up capacity for gas markets in Eastern and Southern Europe.

Based on recent statements made by senior GazProm officials a question mark must be placed over this strategy. Until recently GazProm was planning an East European spur line from the Yamal pipeline project in a north to south direction. This pipeline called Volta was due to run from the Warsaw area of Poland through the Slovak Republic, Hungary, Slovenia to Italy where it would have a delivery capacity of up to 20 BCM/Y. This project would have been a joint venture between GazProm of Russia, Edison of Italy and East European interests. GazProm, together with its Italian handleshouse Promgas, has recently signed gas supply agreements with SNAM of Italy for 8 BCM/Y. Edison would have competed with SNAM for Italian market share. GazProm executives have been noticeably silent about the Volta project after the new SNAM deal was announced. It is now expected that GazProm will use the AGAL pipeline together with present and future pipeline connections between Germany and Italy to deliver additional supplies to the Italian market.

Hungary was also due to receive large volumes of gas through the Volta pipeline. This country has recently signed a contract for the supply of 225 BCM of gas with the Hungarian GazProm handleshouse Panrusgas for delivery thorough the HAG pipeline from Austria. Deliveries under this contract which runs until 2015 can total 12.5 BCM/Y, and all signs are that the HAG pipeline route can replace Volta as a gas supply pipeline for the Hungarian market.

Mediterranean gas markets are growing fast due to a

(continued on page 12)

West European Gas... *(continued from page 11)*

combination of general economic growth, rapidly expanding tourism and the introduction of central heating and air conditioning. As a result, the Balkans together with the Asian part of Turkey represent a valuable market for Russian gas. GazProm has concluded a number of new gas supply agreements with this market area which could purchase some 60 BCM/Y by 2010. This market area could be supplied through the Ukraine, Rumania and Bulgaria. However, some of these countries are demanding transit tariffs at such a high level that GazProm is now considering the construction of a new pipeline across the Black Sea from Tuapse, 100 km east of Krasnodar in southern Russia to Ordu on the Black Sea coast of Turkey. The capacity of such a pipeline, which would cross water depths of up to 2100 meters, is understood to be 16 BCM/Y initially. Such a pipeline solution could potentially free up some capacity in existing pipelines for markets in the Balkans.

Gas Supply Diversification in Central/Eastern Europe

Basic Approach to Diversification

It is understandable that a country would like to diversify its gas import sources in order to improve its gas supply security. In Eastern Europe it is likely to prove difficult to obtain a physical flow of gas from a source other than Russia due to the very substantial flow of Russian gas in an east to west direction across most of these countries. Frequently the best way to achieve gas supply diversification will be a supply deal involving a west European purchaser of Russian gas. During normal operating conditions the East European country will receive Russian gas supplies directly by using Russian gas purchased by its western supply partner. During periods of severe gas supply disruptions, if they should take place, gas will physically flow from the west into the country. Such a scheme should be supported by local gas storage projects to the extent such projects are technically and economically feasible.

When looking at gas supply diversification in East Europe the big question is how much should a country be willing to pay for the additional security which new gas supply sources would represent. As a rule of thumb, it cannot be recommended that a country pay more than a 25 percent premium on the cost of its current gas supply unless such new gas supply is earmarked for applications which are critical to the economy of the country.

The Czech Experience

The East European country which appears most advanced in its overall gas diversification program is the Czech Republic. TRANSGAS, the Czech gas import and transmission company, has been engaged in gas supply negotiations for a total of 3 BCM/Y with western suppliers over the last 18 months. From negotiating exclusively with Norway's gas marketing board (GFU), the company is now reportedly in negotiations with GazProm's cooperation partners Winteshall of Germany and Gasunie of Holland in addition to BEB, Mobil Europe Gas, British Gas and other British producers. TRANSGAS had agreed and initialed a gas supply agreement with GFU for delivery of gas on the German North Sea coast. The latest industry information indicates that GFU now has

offered a gas supply on the Czech/German border at a price which is competitive with Russian supplies.

The Czech cabinet has made a decision in principal that a second route for Russian gas would on its own be unacceptable as a measure of improved gas supply security. It is now likely that TRANSGAS will split the 3 BCM/Y between two suppliers, at least one of which will be based on a true western gas supply. TRANSGAS is also in the process of increasing available gas storage.

Other East European countries should take careful note of the Czech experience. If a gas diversification program should be implemented, then there is now a four to six year window for a strong buyer's market. No time should be lost in using this market situation to ones advantage.

Gas Privatization and Selection of Strategic Investors

Most East European countries have announced plans for the privatization of their gas industries. However, with the exception of Hungary and some of the Baltic states these plans are not very far advanced.

When privatizing the gas industry a country will have two objectives. First, to introduce strategic investor partners which can provide know-how and the necessary expertise to modernize and increase the efficiency of the gas industry. Second, to provide much needed hard currency to the treasury. With the exception of Great Britain and parts of Germany, European gas utilities operate as monopolies in protected areas. Such monopolistic companies are likely to lack to necessary know-how and expertise needed to operate in a true competitive environment. As a general rule, United States and Canadian companies would today be the best source of such experience. However, since U.S. and Canadian companies operate in a true competitive environment themselves, they are unlikely to be in a position to pay the kind of prices accepted by European utilities for ownership shares in Hungarian gas distribution companies. Treasuries and privatization agencies in East European countries are faced with a dilemma, whether to maximize hard currency receipts in the short term or to position the gas industry so that the country will be served by a truly efficient gas industry in the future. Hopefully, some form of compromise between these two positions can be found which will be of overall maximum benefit to the country concerned.

Indian Energy Situation *(continued from page 8)*

issue is to use existing capacity, turn it around, modernize and revamp.

We should not put all our eggs in the basket of only new capacity. Revamping efforts are able to give short-term results, at lower cost and financing is easier. We must have a revamping plan and cut procedures to approve revamping exercises.

Conclusion

What I have covered are just some basic issues regarding energy policy. I may have missed a part or two; however, I do hope that very soon we can call a halt to having only *Conferences on Energy*, again and again, and get the government to act on these issues - for a change!

Report from Taiwan

The 1996 annual meeting of CAEE, IAEE's Taiwan affiliate, was held on October 19, 1996 at Chug-Hua Institution for Economic Research in Taipei. Mr. H. T. Yih, Executive Secretary of the Energy Commission, was elected President. The 1997 annual meeting will be hosted by the Energy Commission, MOEA.

The Taiwanese power industry faces a number of challenges, including:

1. *Liberalization of Power Generation.* Phase I and II open biddings led to the selection of 11 Independent Power Producers (IPPs) who have committed themselves to building a total of 10,300 MW of new capacity.
2. *Diversification.* In order to broaden its business opportunities, Taiwan Power Company established its "Business Development Strategy Group" responsible for its diversification activities such as helping the IPPs build their power plants, power plant operation and maintenance services, telecommunications investments, overseas IPP project investments, etc.
3. *Privatization.* Privatization is the government's policy. The Taiwan Power Company is currently mapping out a most suitable privatization action plan. Taipower is also strengthening its communications with the union and its employees in order to gain their consensus and support. In June 1996 the company established an "Ad Hoc Privatization Reform Team" responsible for the implementation of the privatization program.
4. *Revision of the "Electric Power Act".* The revision of the "Electric Power Act" is now waiting for approval of the Legislative Yuan. The revised Act will divide the operation of the electric power industry into generation, transmission and distribution; a power company will be allowed to participate in only one or two of these activities. Therefore, the organizational structure and operations of the power industry in Taiwan will change in the near future.

I. L. Wang, Taiwan Power Company

Directories: IAEE and Affiliate

By this time, most members should have received the 1997 *Membership Directory*. Affiliates are reminded that Headquarters can provide Directories specially designed for them. Affiliates should contact Headquarters directly for

The Jane Carter Prize

The British Institute of Energy Economics, the International Association of Energy Economics and the Association for the Conservation of Energy invite the submission of essays for the 1996-97 award of the *Jane Carter Essay Prize*. This is offered annually in memory of Jane Carter, former Chairman and Vice President of the BIEE, President of the IAEE and Head of the Energy Conservation Division of the U.K. Department of Energy. The prize for 1996-97 will be a cash award of US\$800 together with a plaque.

Essays can be on any aspect of energy efficiency and conservation. The aim, however, is to encourage new thinking on energy conservation policy. The emphasis of the essay should, therefore, be on the policy rather than the scientific or technical aspect of the subject.

The competition is open to anyone under the age of thirty-five. Essays should not be more than 8,000 words long. The winning essay will be considered for publication in a range of energy journals and a summary will be published in the *IAEE Newsletter*.

Essays should be submitted in English, in triplicate and in typed form, by 30 September, 1997 to:

Mary Scanlan, Administration Secretary
British Institute of Energy Economics
37 Woodville Gardens
Ealing, London W5 2LL
United Kingdom

Essays should include a 150 word summary. The name, address and age of the author should be on a separate sheet which can be detached from the essay which will be judged anonymously. Manuscripts will not be returned.

further information.

Members are reminded to keep Headquarters up-to-date on changes in addresses, titles, affiliations and so on. *Directory Information Forms* to assist in this are mailed with each initial dues renewal notice. In the case of Affiliates, these forms are mailed to the Affiliate President or Secretary in November of each year for distribution. March 31 is the cutoff date for preparing the *May Directory*. Changes received after that date will appear in the following year's *Directory*. Information changes may be sent to Headquarters at an time.

Imperial College of SCIENCE, TECHNOLOGY AND MEDICINE

The MSc in Environmental Technology provides training in environmental economics, law, policy, science, health and technology. The CORE COURSE held in the autumn term provides a broad interdisciplinary understanding of the environment involving law, economics, health and policy with the underlying science. In the second term students select one SPECIALIST OPTION for in-depth study. The third term of the MSc is spent on a practical RESEARCH PROJECT and is designed to incorporate career development skills. Many projects are done with external organizations.

Rapidly evolving energy markets play a key role in most of the world's environmental problems, from the global issue of climate change, through regional damage caused by acid rains, to poor local air quality. The Energy Policy option gives students from a wide range of backgrounds a broad understanding of the role of energy in the global and local economy, and the range of human and environmental impacts associated with energy systems. Examples for case study are drawn from both developed and developing countries. Graduates find employment as energy analysts, researchers, consultants and campaigners in government and international agencies, energy supply companies, large energy users, energy and environmental consultancies and NGOs.

Teaching takes place through a mixture of lectures and seminars, workshops covering analytical techniques and modelling methods, small group project work and site visits. The modules in the Energy Policy Option are: energy economics, law and regulation, planning and analysis, energy use and efficiency, fossil fuels, renewable energy, nuclear power and transport. There are a large number of prestigious contributors to the course, from government, industry, specialist consultancies and NGOs.

The teaching quality of the MSc program has recently been rated the best of its kinds by the Higher Education Funding Council of England and Wales. The 940 graduates since 1977 have been highly successful in gaining environment-related employment. The course is generously supported by the European Social Fund, the ESRC, NERC and a favorable loan facility. For further details contact: The Assistant Registrar (Admissions), Imperial College of Science, Technology & Medicine, London, SW7 2AZ. E-mail s.matthews@ic.ac.uk Tel: +44-171-594-8046; Fax +44-171-594-8004.

MSc in Environmental Technology: Energy Policy Option

Bridging the Energy Gap in Asia: Experience of Strategic Alliances/Joint Ventures in India

*By A. Bhattacharyya**

Global primary energy consumption is expected to reach a level of 11560 million tonnes of oil equivalent (mtoe) by 2010 as against 8104 mtoe in 1996 which would represent an annualized growth of 2.4 percent during the period 1996-2010. The growth rate in the Asia-Pacific region is expected to be around 4 to 5 percent as against an average rate of 2 percent for United States and for the world as a whole. The higher growth has been attributed to rapid population and economic growth, increasing industrialization and road transportation, diminishing availability of noncommercial sources of energy and opening up of energy markets in Asia. India and China together account for 47.5 percent of the total Asia-Pacific demand. The growth in energy consumption has shifted the center of the world's oil and gas demand from United States to Asia. In India, the consumption of petroleum products is expected to increase from the present level of 78 million tonnes (mmt) in 1996-97 to 113 mmt by 2001-02 and 149 mmt by 2010-11. The objective of the oil and gas industry in Asia, in general, and India in particular, is to meet this growth efficiently and on a secure basis.

During 1980-90s, Asia-Pacific, including the Indian subcontinent, overtook the European Community, to become the world's second largest petroleum market after North America. Over 70 percent of the world's incremental consumption during this period was attributable to the region. Between 1996 and 2010, the Asia-Pacific region is expected to add about 200 to 250 million tonnes per annum refining capacity to supply a market growing at 4 to 5 percent annually. A review of capital expenditure plans of the eight largest multinational companies indicates that they collectively invest about US\$25 billion per annum in oil exploration, production, refining and marketing activities worldwide. This implies that even the largest oil/gas major can commit to a new refinery investment in Asia only every two or three years. Moreover, participation in the Asian refining industry by foreign national oil companies has historically been much lower than for the majors. India's own requirement of one quarter of the Asia-Pacific refining capacity during this period represents an enormous capital demand in the global downstream petroleum industry. Therefore, India will need to encourage investment by a range of major private institutions, both domestic and foreign, to raise the required amounts of funds over the next decade and beyond. Potential foreign sources of project financing include long term debt from multilateral agencies like the Asian Development Bank, the World Bank, Japanese lending banks, Global Depository Receipts (GDR), equity investments, credit from oil/gas equipment suppliers, and equity participation in strategic alliances/joint ventures. Multilateral and private lending institutions prefer joint ventures partly because they entail less government involvement. Such ventures can apply private sector industrial practices, which typically translate into greater labor productivity and flexibility.

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The ASEAN experience demonstrates the critical role of the energy sector in building infrastructure for economic development. The commercial energy consumption per unit of Gross Domestic Product (energy intensity) of the South-East Asian economies rose steeply throughout the 1960s, reached a plateau in the late 70's and then declined as these countries expanded into higher value-added manufacturing services. Today, oil usage intensity in East Asian populous developing countries such as China and Indonesia, is two to three times that in the developed economies of Germany and Japan. With India in an energy-intensive phase of economic development, ensuring adequate distribution of hydrocarbon products will be critical to achieve balanced economic growth over the decade.

Despite considerable refinery investment activity in the Asia-Pacific region, continuing high demand growth and a low overall level of refinery capacity are expected to result in a significant deficit of key petroleum products. In particular, India and other developing Asian nations will need to import large quantities of diesel to keep pace with the continuing surge in transport and industrial demand. Notable shortages are also likely to develop in Naphtha (used as a petrochemical feed stock and as a fuel for power generation) and LPG even if all announced projects are completed on time. By 2000-01, India will account for about 15 percent of Asia-Pacific demand for these products. The regional trade in crude oil is substantially deeper than in petroleum products and probably offers a strategically superior source for India, particularly given its proximity to Middle East countries. Among the Middle East national oil companies, Saudi Aramco, Kuwait National Petroleum Company, Abu Dhabi National Oil Company, Oman Oil Company, and National Iranian Oil Company have been the most active participants in Asia. Saudi Aramco, which has a stake in Ssangyong Refining of South Korea, is also involved in a number of joint ventures in Japan, Taiwan, Philippines, Pakistan and India. Oman Oil Company may take a stake in a new refinery in Thailand, promoted by Caltex and PTT, the Thailand State Oil Company, and is also negotiating with the government of India. The National Iranian oil company has proposed a joint venture refinery with Petro Refining and Petrochemical Corporation, State Oil Company in Pakistan.

Expanding India's upstream and downstream hydrocarbon sector to meet the rapidly growing demand for oil/gas will require massive capital investment on the order of US\$ 30-40 billion in real terms. The foreign exchange component of this total is approximately US\$10 billion. This investment is required for the development of onshore and offshore exploration, production of oil and gas, refining crude and petroleum products, storage and marketing installations. Much of the investment in the upstream and downstream sectors is likely to flow through existing and new domestic and international companies. Assuming that lending to these new companies will be guided by international norms (i.e., debt - equity ratio of 2:1) India's total capital requirement for the petroleum industry will increase to about US\$10 to 12 billion in equity and US\$24 to 26 billion in debt. However, neither India's public sector equity funding nor the domestic capital market appear capable of meeting these requirements. The magnitude of required investment implies that the hydrocarbon sector must continue to rely on foreign sources of long term debt to fund its expansion program and allow

joint ventures which are distanced from government involvement. The public sector undertakings (PSU) in the Indian petroleum industry view private joint ventures (JVs) favorably because: (1) JVs allow the PSUs to deploy their scarce equity resources more effectively, thereby accelerating expansion (e.g., PSU may promote a joint sector project with only 26 percent equity participation), (2) raising funds in the primary capital market is likely to be easier with a reputable private partner, (3) JVs offer the potential for the transfer of private sector management practices and foreign technologies, and (4) JVs may permit greater autonomy in decisionmaking, particularly with respect to new investments and plant operations because JVs are typically outside government controls.

Governments in several Asian countries are pursuing industrial deregulation and restructuring (e.g., price decontrol and selective introduction of competition) to improve efficiency and service quality, in preference to a radical change in private ownership. In Taiwan, for example, liberalization of the lubricants market and the introduction of private ownership for fuel retailing have created awareness of the need to improve the cost and service performance of government owned companies, e.g., China Petroleum Corporation. Such changes are being implemented in Indonesia, Malaysia, Philippines and Thailand. These changes may represent the first step toward the large scale privatization that has been conducted with considerable success in Latin America and Western Europe. In Spain, the need to open the large state-owned refining and marketing industry to the competitive forces of the European Community by 1992, provided the motivation to simultaneously deregulate, restructure and privatize the hydrocarbon sector over a 7 year period. Today, the Spanish petroleum sector operates with minority government ownership and financial commitment and is competitive and integrated with European import markets. A similar program in Argentina was undertaken in response to the poor performance of the petroleum sector and macroeconomic crisis. This has created an estimated US\$ 1.5 billion in shareholder value in refining, distribution and marketing activities of the privatized YPF, the state oil company.

The Government of India (GOI) has recently taken a number of important steps to enhance the attractiveness of private capital in the petroleum industry. These steps included partial decontrol of prices, enhancement of investment in the last several Union budgets and some improvements in approval procedures. The GOI has freed kerosene and LPG prices and allowed partial private sector distribution of these sensitive products. Lubricants are totally decontrolled and delicensed. The Indian economy has witnessed more than 20 private players in the lubricants market (both automotive and industrial components) with half a dozen joint ventures in the marketing of LPG, kerosene, LSHS, and Naphtha (restricted to captive uses). Private domestic and foreign companies have been offered 100 percent equity in exploration and production (E&P) with joint venture options with the Oil and Natural Gas Corporation (ONGC), Oil India Limited (OIL), and State-owned E&P companies. Small and medium sized proven oil/gas fields are offered on concessions. This has generated interest in domestic and international oil companies seeking an integrated presence in India.

Joint ventures in medium sized fields like Mukta, Panna, and Tapti Ravva include ONGC, Enron, Reliance, Command Petroleum, Tata Petrodyne, Marubeni and Hindustan oil exploration companies. ONGC Videsh Limited has a JV with Statoil, Norway and British Petroleum in Vietnam has already discovered 2 tcf of gas and is in the process of forming more JVs with National Oil companies of Yemen, Kazaksthan, Egypt, Turkmenistan, Tunisia, Nigeria and other former Soviet Union countries to bring "equity oil/gas" to India. Negotiations are on with Ensearch Inc. and ONGC for the development of small sized fields in the United States. JVs are in operation in Norway, UK, USA, and Germany for development of state-of-the-art technology in exploration and production. In the case of refineries, letters of intent have been issued to more than 10 private companies to build around 24 million tonnes per annum of refining capacity (i.e., 480 thousand barrels per day) by the year 2001-02. The first joint venture refinery, Mangalore Refinery and Petrochemicals Limited (MRPL), has started commercial production of 3 million tonnes per annum (60,000 barrels per day) and will expand another 60,000 barrels per day by 2000-01. Other JVs are Indo-Mobil (i.e., Indian-Oil Corporation-Mobil Inc., USA), Bharat Petroleum Corporation-Shell International, IBP-Caltex, Hindustan Petroleum corporation with ESSO and Total, among others. Moreover, GOI has diluted state ownership in downstream new projects in the range of 30 to 40 percent to promote joint ventures and private funding. The last several Union (federal) Budgets have slashed custom duties for petroleum products from more than 100 percent in the 1980s to 25 percent in the mid-1990s to make capital goods imports more competitive with those of Asian countries. The Union Budget of 1997-98 has removed custom duties and excise duties on plant and machinery required for Indian private/public/joint venture expansion/debottlenecking for grassroots refineries. Domestic suppliers of equipment to refineries will also get needed export benefits in terms of tax concessions. A New Exploration Licensing Policy (NELP) has also been announced to attract risk capital in exploration and production with a package of fiscal incentives, e.g., tax holidays, reduction and exemption of royalties to be paid to State Governments in frontier/deep offshore areas/marginal oil/gas fields, freedom of marketing of oil/gas to PSUs/government/outside agencies, etc. With the import content of upstream and downstream investments, currently estimated at about 15 percent, and India's already strong position in equipment fabrication costs, this progressive reduction in tariffs would distinctly improve the cost structure of private, public and joint venture producers in the petroleum industry.

While government control of the domestic upstream and downstream sector is likely to continue, GOI has adopted a number of flexible structures to promote joint ventures to take advantage of India's vast energy market. JV partners will sign long term contracts for the sourcing of imports of crude oil and petroleum products for domestic distribution and the exporting of the rest in the case of export oriented refineries. Revenue from exports will then be used to pay back the nonrecourse financing put up by foreign partners. With GOI resolve and proper resources brought to bear on JV initiatives, India is committed to meet its critical private investment needs in the upstream and downstream hydrocarbon sectors.

Globalization: Challenges and Opportunities in Shaping a Common Future

By R .K. Pachauri*

The issues I want to highlight related to globalization are essentially those related to several changes that are taking place and several that are not changing. The first applies to the implications of the information revolution. As energy economists we have learned enough, and have researched enough, into issues of energy supply and what contributes to demand, that is, what the factors are that contribute to demand for energy. But we have not really looked at major changes of a structural nature that are taking place round the world and I would like to highlight the information revolution as one. Come to think of it, if you go around the poorest slums of any developing country, you will find that even homes which don't have any furniture at all will possess a television set. And this is not merely a symbol of something that revolves around entertainment, but TV is a means by which you are really bringing the rest of the world into the poorest slum dwellings in the remotest corners of the earth. And obviously this would lead to rising aspirations, it would lead to a shrinking of the globe in the sense of removing mental, political and other barriers.

We need to see what the impact of this information is likely to be. For instance, I would like to say that in countries such as India, poverty has been there for several decades, perhaps, hundreds of years. It was something that was accepted as a given fact. But with the enormous political changes that have taken place, given the fact that we have a democracy which has taken root strongly – I feel very proud of the fact that the Prime Minister of the country today is a very humble farmer – the old era of leaders who came from the elite sections of society, has obviously been demolished by the firm roots that democracy has taken in this country. Now because of these changes and the fact that there is this enormous advance in terms of availability of information, the aspirations of the poor are not likely to remain static. And we, therefore, have to deal with the aspirations of those who want a better way of life and are indeed entitled to a better way of life.

I am saying this because in the global context, unfortunately this reality is often missed. I do appreciate the fact that the largest growth in demand for energy is going to take place in the developing countries but as I will show with numbers a little later, the fact still is that a very large section of this globe is energy deprived and that extent of deprivation is not related merely to luxuries like space heating and cooling, freedom to use transport as and when one wants, but to those very basic needs for cooking. In this country itself where 70 percent of the population resides in rural areas, there is still an overwhelming dependence on biomass. And it is almost a mystery where that biomass comes from. If you look at the sustainable yield of the forests in terms of providing fuelwood, it is a very small share of the total consumption that takes place. So this essentially means that people are using twigs, are using leaves, are using agricultural residue, animal waste

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and all kinds of sources of energy, which certainly don't lend dignity to the fact that we are heading towards the end of the twentieth century.

So I want to emphasize this dimension of poverty. And it is not easy to meet the demands of the poor, simply because they are not able to purchase the fuels that may be available through the market system. And yet, we need to bring about improvements in the efficiency of energy use, and we need to bring about institutional changes whereby the supply of energy (in the case of the poor, it will probably remain biomass energy for a long time to come) is made available to the poorest of the poor.

I am putting this issue before you because in the context of climate change, if you look at the findings of the Second Assessment Report (SAR) of the IPCC it is very clear that human intervention is bringing about climate change. It is also very clear and scientifically specified by the SAR that we need to stabilize the emission of greenhouse gases.

Now this obviously will require a change in the way we do business, a change in the way we live. And I am afraid talking about lifestyles is often a taboo, because it is regarded as some kind of a threat to those who have reached a high level of opulence and also seen as the poor wanting to take over the world and suggesting that "you shed your opulence and pass it on to us." I don't think it is as simplistic an issue as that. The basic problem is that there will be burdens that are imposed on several societies of this world. And as the Framework Convention on Climate Change clearly specifies, there are differential but common responsibilities and the differential responsibilities arise out of the fact that historically the concentration of greenhouse gases has been created above what might be called acceptable levels by consumption of fossil fuels by a very small section of the population of the globe.

So when it comes to looking at burden sharing in the future, I think, we need to understand that if you ignore the realities of poverty that exist in large sections of the globe, we would in essence be creating a situation which socially and otherwise would prove very explosive over a period of time. Even today, if you look at the increase in emergency assistance related to disasters, to political turbulence, to skirmishers, and to wars, there is a dangerous increase which obviously is going to supplant development assistance. In other words, you find that instead of preventive cure, we are now looking at solutions after the fact for disasters and crises.

It would be in order to look at globalization in the context of the problems of the future, wherein there are positive opportunities. The biggest opportunity is that since we are in an era of globalization, it should be possible to use resources as efficiently as possible and it should be entirely possible to produce energy and goods and services in the most efficient manner, simply because the boundaries that political – and, therefore, economic – divisions in the past have created, are gradually breaking down. You see signs of that in this country. A large part of the software development industry is located in the city of Bangalore, simply because it is much cheaper to produce software in the city of Bangalore than, say, in Texas. This kind of thing will happen, which means that there is a net welfare effect all over the world from which others can benefit.

But, I would still highlight the lack of policy, the lack of vision on what needs to be done for energy for the poor. And

I would submit that this still remains to a large extent the responsibility of governments, of international organizations and the international community at large. In the interest of brevity, I will only highlight the fact that we need some new development paradigms. I think, we have pursued a path of structuring our economic activities in a manner that was dictated by one single paradigm.

There is perhaps, now need to look at de-urbanization and I think the new information technology makes it possible to decentralize economic activities, reduce the congestion, reduce pollution in our cities and this can be done if we start internalizing the costs of pollution and environmental damage in our pricing decisions. The other opportunity that comes from globalization is the sharing of experiences. We are trying to attract private sector investments in the energy sector in this country. I regret, we have not taken advantage of the international experiences in this regard and that is why the success is less than perfect.

Lastly, I wish to mention a major project that we have in our Institute called GREEN India 2047 - Growth with Resource Enhancement of Environment and Nature - about which we will be very happy to provide you some material. What we are really looking at is the last fifty years of India's development, that is, since Independence, whereby we have grown, we have established institutions, but at the same time we have damaged our natural resources. We are trying to catalogue this damage and depletion and provide an economic

Table 1.
Conventional Projections for Use of Industrial Energy Forms

	Actual		Projection			
	1980	1990	2000	2010	2020	2030
Population (millions)						
Industrialized	1075	1158	1215	1260	1295	1315
Developing	3310	4085	5000	5900	6750	7575
Energy User/Person (watts)						
Business as usual						
Industrialized	7170	7255	7360	7465	7570	7675
Developing	615	770	965	1205	1500	1880
Energy Efficient (Anderson)						
Industrialized	same		7435	7225	6325	6285
Developing	as above		950	1340	1720	2300
Total Energy Use (terawatts)						
Business as Usual						
Industrialized	7.7	8.4	8.9	9.4	9.8	10.1
Developing	2.0	3.2	4.8	7.1	10.1	14.2
World Total	9.7	11.6	13.7	16.5	19.9	24.3
Energy Efficient (Anderson)						
Industrialized	same		9.0	9.1	8.2	8.3
Developing	as		4.8	7.9	11.6	17.2
World Total	above		13.8	17.0	19.8	25.5

Notes: Business as usual results obtained by extrapolating 1980-90 rates of increase in per capita use of industrial energy forms for industrialized and developing countries. One terawatt = 1012W.

Source: Theme paper on "Energy". (In) Proceedings of the International Conference on An Agenda of Science for Environment and Development into the 21st Century, (eds) J.C.I. Dooge, et al, Cambridge University Press, New York, 1992, 103-118, Holdren, J.P. and Pachauri, R.K.

value to the loss incurred and project these fifty years into the future. I would like to submit that this project is really taking a longer term vision that can sensitize and reshape the thinking of human beings and bring about the development of new paradigms that I mentioned a little earlier.

Table 1 shows some numbers related to this subject. This table is from a paper that Professor John Holdren and I had coauthored for a conference in 1991 before the Rio Summit, where the scientific community from all over the world got together to develop a scientific and technological agenda for meeting the needs of the future. These projections clearly brought out that even with the increases in energy consumption that are taking place, there would still be enormous disparities between the industrialized and the developing countries, and, therefore, we had come up with a thesis that perhaps, efficiency improvements in the developed countries would provide them an opportunity to retain and even improve standards of living and thereby reduce the consumption of energy, thus permitting the developing countries to continue to increase their energy consumption - efficiently, of course - whereby you could still keep some kind of a cap on the overall emissions of the globe and overall environmental problems that are associated with the use of energy.

In conclusion, without going into detail, I trust I have been able to mention a few issues that I feel are of relevance in looking at globalization and its impacts, particularly for the energy sector.

John A. and Donnie Brock Chair in Energy Economics and Policy

The College of Engineering and the Sarkeys Energy Center at the University of Oklahoma invite nominations and applications to fill the John A. & Donnie Brock Chair in Energy Economics and Policy. The successful candidate will provide leadership in the Energy Economics and Policy Institute in the University of Oklahoma's Sarkeys Energy Center.

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A Perspective on Russian Oil

By Isabel Gorst*

It is a great honor to receive the International Association for Energy Economics annual award for excellence in written journalism. Excellence is an outdated concept: I hope I have deserved and will continue to deserve this compliment. I would like to thank the IAEE for presenting me with the award and for inviting me to Delhi to attend their 20th Annual conference. For a long time I have dreamed of visiting India. But I never imagined I would be able to do so in such happy circumstances. I also have a debt of thanks to Ed Morse, publisher of *Petroleum Intelligence Weekly*, for his support during the five years I have worked as an energy journalist in Moscow. In the spring of 1991, I asked Mr. Morse if *PIW* would consider sponsoring me on a three month experimental reporting trip to Russia and the Former Soviet Union (FSU). His response was an immediate "Yes." Not every publisher takes a bet like that especially as it must have been obvious that I, like everyone else hurrying to Russia at that time, would be seeing my way in the dark that first summer.

I'm not going to talk for very long because it's lunch time and everyone in this highly specialized and knowledgeable audience must want a rest from speeches. Sadly, Russia and the FSU, which are the areas I know most about are not currently very active participants in the international debate about sustainable growth that you are all concerned with. What is positive, however, is that economic reform in Russia has already begun to encourage a far less wasteful use of energy than in the past. Environmental issues, largely taboo during the Soviet Era, are now much higher on the agenda, I hope. I think everyone hopes, that Russia, which traditionally has nurtured highly creative and intelligent scientists and engineers, will before long find itself in a position to devote resources to the development of alternative energy as it did so actively in the Soviet days. This may even turn out to be a fruitful era for foreign cooperation.

Some time ago one of my more humorous sources said to me, "You've got a great job. Anything can happen in Russia. Whatever you say is going on or will take place, people will believe you." In fact no one could have really have predicted the changes that have taken place and are still continuing in the Former Soviet economies and in particular the energy industries.

When I first started working in Moscow in 1991, the mood among foreign oil companies was heady, even euphoric. The secrecy that had so long shrouded the Soviet energy industries had fallen away. Huge untapped oil reserves were being opened up to foreign investors in areas many had never even heard of: Komi, Sakhalin, Krasnoyarsk, etc. It was a time of extraordinary hope.

For the lone reporter, finding accommodations in Moscow was the first hurdle. It seems unbelievable now, but *PIW's* first temporary Moscow office was set up in a flat normally let out to honeymooning couples. Except for a sea of empty bottles in the kitchen, it was comfortable and well

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appointed by local standards at the time. My neighbors were writers and journalists who had made a living commenting on and translating Victorian literature into Russian. In the lobby that we shared there was an almost insurmountable pile of Lewis Carrol's *Jabberwocky* published in the Russian language. *Jabberwocky*, for those unfamiliar with it, is written in a bizarre language invented by Lewis Carrol to create a fantastic, sometimes grotesque world of complete nonsense. Looking back, I can see that both the honeymooners flat and the *Jabberwocky* mountain I scaled each morning expressed the circumstances faced both by the Russian economy and the pioneering foreign oil companies in Moscow far more eloquently than any of the reports I prepared for *PIW* and other journals at that time. Originally destined for Estonia as part of a Books-for-Beef barter deal, the unwanted *Jabberwockies* rotting on my doorstep were just one among many sad casualties of the collapse of the Soviet command economy. In the midst of such decay, hopes were high in that a new, profitable long term relationship would quickly flourish between the Russian and Western oil and gas industries. Sadly, such hopes were over romantic, built in the context of enchanting nonsense. The Russians had virtually no experience of dealing with international business and no legal base to support and define complicated, long term oil contracts. But their oil reserves were very attractive.

Five years later, disappointment has replaced the romantic euphoria of the early 1990s. Some important upstream deals have been struck. But most major international oil companies are still locked in seemingly interminable negotiations for access to Russian oil fields. It now looks unlikely that foreign corporations will gain control over large volumes of Russian oil reserves in the short term at least. Where contracts are signed, foreigners will be working alongside Russian companies that hold sizable interests in each project. International interest has now shifted away from Russia to the Caspian Sea and Central Asia, where, apparently there is a more welcoming investment climate.

The future now opening up is going to present some exciting challenges and will demand both from the West and from the FSU an even more flexible and innovative approach to energy cooperation. Many of the Russian oil companies that emerged from the ruins of the old Soviet Ministry of Oil and Gas have now privatized. They are eager to find a place on the world stage where they can explore and produce oil alongside the international companies they now regard as competitors. It may take time for the Russians to raise capital to fund foreign oil adventures. But sooner or later they will arrive.

Another change possibly on the way which has some relevance for Asia is the partial redirection of Russian oil trade with the outside world. Until now, the bulk of Russian and former Soviet oil exports have flowed through Central Europe and the Mediterranean to the West.

Last summer, foreign oil companies began developing deposits offshore Sakhalin Island in the Russian Far East. Eventually, these waters will provide an important source of oil and gas for the Asia-Pacific region.

Meanwhile, the search has begun for eastern outlets for Siberian Central Asia's huge oil and gas reserves. International and regional politics may prevent these projects from moving very fast. But the important thing to notice is that Russia's two headed eagle really can look in two directions.

Foreign companies are studying the feasibility of building pipelines to carry Russian and Central oil and gas through Afghanistan to Pakistan. Meanwhile, Kazakhstan has recently begun moving oil across the Caspian Sea to northern Iran in exchange for crude exported out of the Arabian Gulf on Kazakhstan's account. Although this contract is small and somewhat tentative, it is now not impossible to foresee a time in the future when Iran emerges as an important corridor for central Asian oil flowing to export markets.

The possibility of dramatic political changes in Russia and the FSU cannot be discounted. Quantifying the risk associated with such change is one of the most difficult and pressing problems facing investors and commentators in the region. Large numbers of people regret the advent of the free market in Russia that has carved in its wake mass poverty, unemployment and a particularly harsh capitalist order. Government must to some extent respond to public discontent or risk social upheaval. Russia is unlikely to try to reverse reform altogether, but its unique experience in what looks like being a lengthy period of transition will promote the growing international debate about the appropriate role for regulation in emerging free markets.

The business of energy newsletters and journals is to promote a fast, reliable news service and, in a broader context, to spot the trends that herald the changes taking place in the world of energy. Journalists are dependent on their sources both for information and for guidance with analysis that should help throw light on an often confusing web of events.

I'd like to end by thanking everyone who has helped me with my work. They have been kind to me. History has been kind to me placing me in an exciting place at an exciting time. I hope everyone in this hall enjoys good work as well.

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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Responding to International Energy-Related Environmental Challenges: The Case of the African Energy Policy Research Network

*By Stephen Karekezi**

In the recent past, three important global environment initiatives have refocused attention on energy efficiency and renewables. The first was the publication of the widely-acclaimed report of the World Commission on Environment and Development chaired by Gro Harlem Brundtland of Norway.

The second important event was the United Nations Conference on Environment and Development (UNCED) held in Rio de Janeiro, Brazil in 1992. At this Conference, an ambitious environment and development document entitled "Agenda 21" was endorsed by a large number of multinational companies. In addition to other objectives, Agenda 21 sought to operationalize the concept of sustainable development. The Rio Conference also provided the venue for the third important event, the signing of the United Nations Framework Convention on Climate Change (UNFCCC) by 155 Governments.

Energy efficiency and renewables feature in both Agenda 21 and the Climate Change Convention. Because of the important role of fossil fuels in the build-up of greenhouse gases and concomitant climate change concerns, renewables and energy efficiency are perceived to constitute an important option for mitigating and abating the emissions of greenhouse gases (Socolow, 1992). This issue has attracted considerable attention from industrialized countries' researchers and policymakers many of whose countries have largely managed to provide modern energy services to virtually all their inhabitants.

The above perception is, however, not fully shared by developing countries, particularly, those from Africa. In contrast to the industrialized world which is worried by the long-term global environmental impact of current patterns of energy production and use, African countries are largely preoccupied with the immediate and pressing demands for a minimum level of modern energy services for the majority of their population – many of whom have no electricity and continue to rely on inefficient and environmentally hazardous unprocessed biomass fuels.

Although the contribution of African countries to global greenhouse emissions is, on a per capita basis, much smaller than that of industrialized countries, there is growing realization that Africa is likely to be disproportionately affected by the impacts of climate change. Of particular interest is the dependence of many African countries on rain-fed agriculture which is believed to already be under threat from unpredictable weather patterns triggered by what appears to be climate change linked to the accumulation of greenhouse gases in the atmosphere. Nonetheless, the position of Africa on the climate change question is far from unanimous. During the negotiations before and after the signing of the

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Climate Change Convention, support for binding targets that would require dramatic increases in the uses of renewables and energy efficiency technologies was, at best, lukewarm on the part of oil-exporting and fossil-fuel dependent African countries such as Nigeria and South-Africa.

In industrialized countries, greater interest in energy efficiency and renewables partly stems from concern over global environmental problems but is also partly driven by a growing perception of energy as a service which moves energy sector development away from a purely supply oriented and conventional fuel-dependent strategy to one that places demand-side interventions, energy efficiency measures and renewables on an equal footing with increases in conventional energy supply. Hence the growing interest in alternative energy response measures such as demand side management (DSM), integrated resource planning (IRP), decentralized energy systems and renewables.

In general there is now a growing consensus that the role of alternative energy development approaches (encompassing renewables, energy efficiency and decentralized energy options) will grow in importance in the energy sector of industrialized countries. The acceptance of alternative energy approaches is further underlined by the diminishing use of the term "alternative" because of the growing perception that renewables, energy efficiency and decentralized energy approaches are an important option for mainstream energy sector development.

A similar consensus has not yet emerged in Africa for a variety of reasons. Alternative energy sector approaches are constrained by the limited pool of energy sector planners in Africa. The few who are available are employed by the nationalized utilities which have a strong supply-oriented culture, or work in Ministries of Energy where the unattractive remuneration packages dampen work enthusiasm and commitment. Energy sector planners outside the utilities and Ministries are rare. It is only recently that a number of NGOs and independent research institutes have started developing the capacity to evaluate and develop energy sector plans. These new agencies often operate under stringent financial constraints which limit their capacity to undertake long-term energy sector review.

NGOs and research institutes outside the government and utilities often face serious difficulties in gaining access to the requisite information and data. Information that would normally be publicly available in the developed world would either not be available or be declared confidential and proprietary material that can only be divulged to employees of the government and utilities. The advent of multi-party democracy which has ushered in greater transparency is changing the situation and access to the existing information and data is improving.

The accuracy and reliability of the available data, however, is far from satisfactory. This is particularly true of demand side data and renewable energy resource assessment which requires regular surveys. This is further compounded by the existence of an informal sector that taps the electricity sector often without appropriate documentation and outside the metering system. Comprehensive surveys that would capture this segment of the consuming sector are costly.

Finally, the most important near-term barrier to alternative energy approaches appears to be acceptance by senior energy analysts, policymakers and utility managers in Af-

rica. In this respect, the experience of the African Energy Policy Research Network (AFREPREN/FWD) in introducing energy efficiency and demand-side management issues in its research program is particularly instructive.

African Energy Policy Research Network (AFREPREN)

The AFREPREN program brings together over 90 African energy researchers and policymakers from Eastern and Southern Africa who have a long-term interest in energy research and the policymaking process. AFREPREN members include senior energy policymakers (from the level of Assistant Minister of Energy to directors of national utilities), university researchers, and NGO representatives. AFREPREN has initiated policy research studies in 18 African countries. In addition, AFREPREN maintains close collaborative links with energy researchers and policymakers from several other African countries.

The key objective of AFREPREN is to strengthen local research capacity and to harness it in the service of energy policymaking and planning. Initiated in 1989, AFREPREN is a collective regional response to the wide-spread concern over the weak link between energy research and the formulation and implementation of energy policy in Sub-Saharan Africa. AFREPREN members decide on the structure, direction and mode of operation of the Network. A Secretariat established at the offices of the Foundation for Woodstove Dissemination (FWD) in Nairobi, Kenya coordinates the research program of AFREPREN and provides the requisite administrative and technical support.

Milestones

Important achievements of the network include the following:

1. The establishment of a research network involving over 90 principal and assistant researchers from 18 countries of eastern and southern Africa. In its first, second and third phases, AFREPREN showed very encouraging signs of success, indicated by an increased impact on the region's energy policymaking process; timely submission of research reports by the overwhelming majority of researchers and, positive assessment of an independent evaluation commissioned by its principal donors in 1993.
2. The successful launching and implementation of 18 major regional research projects in the 91 subject areas of Renewable Energy Technologies, Biomass, Oil and Gas, Coal and Gasification, Institutions and Planning, and, Electricity.
3. The worldwide release of 9 major volumes on energy that brings together the summary findings of the first phase of the AFREPREN research program:
 - African Energy Issues
 - A New Environmentally-Sound Energy Strategy for the Development of Sub-Saharan Africa
 - Energy Management in Africa
 - Rural Electrification in Africa
 - Energy Options for Africa – Environmentally Sustainable Alternatives
 - Biomass Energy and Coal in Africa
 - Transport Energy in Africa

• Energy Utilities and Institutions in Africa

These nine publications constitute a major contribution to the region's energy literature and are unique in having been largely authored by local energy researchers in the region.

4. The production of over 100 research reports as well as numerous special issue papers which assess the state of art in particular research theme groups and provides guidance on research methodology.
5. Publication of 120 working papers on energy issues, Energy Country Profile reports; dossiers on energy publications, AFREPREN Library Acquisition reports; 15 newsletters, and over 20 AFREPREN Information Circulars and Updates.
6. The establishment of an AFREPREN office in Nairobi, Kenya which provides the following services to AFREPREN members: provision of logistical and management support; distribution of background documentation, and the regular publication of AFREPREN publications, newsletters, brochures and reports.
7. The organization of eight major Regional Workshops that brought together all AFREPREN principal researchers, theme editors, resource persons and observers. These Workshops provided excellent platforms for assessing the progress of research work, strengthening network coordination, facilitating the exchange of information, and increasing the impact of the policy research work of AFREPREN.
8. The organization of three special Seminars examining various aspects of the energy sector in Africa. The first was a UNEP and DANIDA-financed Meeting of African Energy and Environment Experts to prepare a *A New, Environmentally-Sound Energy Strategy for the Development of Sub-Saharan Africa*. The second Seminar was a specialized Training Seminar on *Energy Efficiency* organized in Gaborone, Botswana in conjunction with one of the main Regional Workshops. The third Seminar was a high-level African Energy and Environment Policy Seminar held in Nairobi, Kenya and which brought together over 40 African senior energy policymakers and experts from eastern, southern, central and western Africa as well as observers from Sweden, Norway and Denmark.
9. The provision of support for the formulation of a national energy policy for the newly formed Government of Zambia. AFREPREN provided instrumental financial and technical support for the preparation of background documents for Zambia's national energy policy initiative, as well as, for the organization of sector-specific national seminars.

While the above achievements appear to be substantial there are other important but less tangible achievements of the network. The first and perhaps most important benefit is a result of the unique composition of the research teams. Whenever possible, the country teams are composed of a researcher from the academic community (usually the national university or independent research agency/NGO) and a researcher from the government sector (usually the national Ministry of Energy or national energy utility).

There are now six country teams in which joint teams of policymakers and researchers undertake research projects.

(continued on page 22)

African Energy Policy... (continued from page 21)

The pairing approach effectively ensures that the policymaker who is the primary target of the findings of the AFREPREN research program is involved in all aspects of the Network. In the newly launched phase of the AFREPREN research program, the pairing approach has been further strengthened. The advantage of pairing has been demonstrated in terms of the quality of research findings (compared with research projects carried out either by researchers only or by policymakers only) and linking of research work to active and ongoing policy formulation and implementation. At least seven countries (Angola, Ethiopia, Kenya, Mauritius, Sudan, Uganda and Zambia) have recorded implementation of the results of the research project. In the 1995-1997 phase of the AFREPREN, the number of country pairings has been increased to further replicate the successful pairing strategy.

The second important benefit realized by AFREPREN is the extent to which the research program has contributed to local institutional development. AFREPREN was formulated and is now coordinated and managed by local researchers who have a long-term interest in local energy issues. At least six of the country research teams have established independent energy policy centers in Botswana, Kenya, Mozambique, Uganda, Zambia and Zimbabwe. Another important benefit is the opportunity that the network provides to key energy policymakers and researchers to address long-term policy issues that are rarely given the required level of attention.

Between 1987 and 1994, the AFREPREN program has implemented research projects around six major energy themes, namely: Renewable Energy Technologies (RETs), Electricity, Biomass Energy, Coal and Gasification, Institutions & Planning, Oil and Gas.

Ensuring Greater Emphasis on Environment and Related Energy Efficiency Issues

As shown above, the AFREPREN research program was, until 1994, organized along supply-side lines. At the fourth Workshop of AFREPREN, concern was raised with respect to the continued focus on energy supply emphasized by the supply themes of the current AFREPREN research program. While renewables were perceived to be adequately addressed by the AFREPREN research program, some network members stressed that environment and demand-side issues have not received the expected level of attention and successfully argued that the potential for energy efficiency had not been sufficiently examined by the AFREPREN research program.

To address the energy and environment nexus and related energy efficiency issues, AFREPREN requested two of its members, Stephen Karekezi and Ogunlade Davidson to prepare a special strategy document to address this gap in the AFREPREN research program. The document was entitled: "A New, Environmentally-Sound Energy Strategy for the Development of Sub-Saharan Africa." In this document, major recommendations were made with respect to the need for energy efficiency and demand-side management interventions in the energy sector of the region. The document stated that energy efficiency/DSM measures provide the opportunity of using energy savings to supply more consumers with no added adverse environmental effects. To promote

energy efficiency, the document urged the implementation of, *inter alia*, the following measures:

1. Encourage the development and establishment of energy service companies in the public and private sectors. Activities of these companies should include promotion, testing, manufacture and marketing of energy efficient technologies and implementation of energy efficiency/DSM programs.
2. Support R&D efforts in energy efficiency/DSM and establish mechanisms for accessing information on available energy efficient technologies such as, improved cookstoves, efficient electrical household appliances and lighting systems, efficient electrical motors, and energy conscious architecture. Special attention should be placed on the development of new methodological tools and innovative approaches for technology adaptation and modification.
3. Develop national energy efficiency/DSM packages which provide performance data and relevant technical specifications of known technologies. These packages should be designed to assist policymakers, entrepreneurs, researchers and end-users in selecting appropriate energy efficient technologies and formulating feasible energy standards. In addition, the packages should include information on known practices such as basic retrofitting, housekeeping measures and more complex management and public education techniques for reducing energy consumption.

In the main, the options outlined above received broad support within the AFREPREN network but there was some residual skepticism arising from two negative perceptions:

1. A tendency to perceive the growing interest in global environmental issues and related energy efficiency/DSM as a transitory fad in the North that like other fads of the past (renewables, biomass and integrated national energy planning) will yield few tangible benefits and, more importantly, may take resources away from ongoing and planned energy initiatives aimed at meeting urgent and pressing problems faced by the region's energy sector.
2. A lingering suspicion that the emphasis on environmental conditionality and energy efficiency/DSM may be the leading edge of a hidden agenda aimed at denying the region its fair share of the world's dwindling resources of fossil fuels. This was reinforced by existing data showing that Africa's per capita consumption of commercial energy was the lowest in the world (World Bank, 1992) and that the bulk of petroleum production was destined for export markets in the industrialized world rather than internal consumption.

Convincing the skeptical minority within AFREPREN of the viability and utility of giving greater prominence to demand-side issues and environment was an uphill task which holds important lessons for ongoing and planned energy efficiency/DSM initiatives in the region (for example the regional energy efficiency program of the Southern African Development Community, SADC). Within the skeptical minority, the pragmatists were the first to turn around on the issue of DSM. As expected and as explained below, the rationale was not altruistic.

1. The pragmatists realized that the region is, more than ever, dependent on external donor agencies for its development and, in certain cases, for its survival. The energy sector is under the same pressure. Within donor circles, an emphasis on demand-side issues, energy efficiency and environment is now a must. AFREPREN, like other energy initiatives on the continent, has to accommodate the new thinking, which in any case is highly beneficial to the region's future development.
2. It also dawned on the pragmatists that an emphasis on DSM and end-user oriented methodologies and techniques for incorporating environmental factors in energy development will assist in equipping the region's policymakers with the necessary skills to negotiate with the energy efficiency experts and assorted consultants who are already descending on the region in increasing numbers. DSM, energy efficiency and global environment issues are, in some respects, the latest fads and the region's policymakers need to be able to separate the sound ideas from the frivolous and unnecessary exercises. Otherwise, past errors associated with past fads (integrated energy planning, renewables and, biomass energy) may be repeated.
3. The pragmatists also realized that end-user oriented strategies provide the region with the opportunity to reduce the high capital and investment cost and environmental problems associated with a purely supply-side approach.

Eventually, the rest of the skeptical minority became supportive of demand-side and environment issues because of the following reasons:

1. A demand-side and environmental perspective requires close collaboration with end-users and thus ensures participation – a key to development; another important spin-off in that it operationalizes an integrated approach to development.
2. By moving away from a purely supply-oriented approach, the demand-side perspective ensures that *management and organization* are at the center of energy policy debate. This is particularly important to the African region where the energy sector is characterized by mismanagement and disorganization.

To strengthen the understanding of the above issues, AFREPREN organized a special training workshop on energy efficiency/DSM and environment in early 1992. Consequently, the third phase of the AFREPREN research program placed greater emphasis on environment and energy efficiency/demand side issues with all the projects making a determined effort to take account of environmental concerns. In addition, two projects focused on two important energy-related environmental issues, namely, indoor air pollution and greenhouse gas emissions.

As a response to its members' call for more emphasis on environment and energy efficiency/demand side dimensions of the region's energy sector, AFREPREN has reoriented its new research program along the following six major cluster of issues:

- *Local and Regional Environmental Impacts of Energy:* Examining both existing and projected impact of the energy sector on the local and regional environments and designing cost-effective measures of mitigating potentially negative

impacts of energy production, transformation and use.

- *Energy and Climate Change:* Assessing the policy implications of the United Nations Framework Convention on Climate Change and developing realistic and practical negotiating as well as implementation options for the African energy community. Researchers in this theme are examining options for mitigating greenhouse gas emissions in the transport sector.
- *Management and Efficiency:* Design and assessment of techniques for improved management and increased efficiency of existing energy assets with specific reference to the power sector and stimulation of power exports and imports in the region.
- *Institutions:* Formulation of innovative institutional initiatives that promote equitable access to energy services; special attention to be focused on the opportunities and pitfalls inherent in the current emphasis on privatization and deregulation of the power sector in the region.
- *Capacity Building and Technology:* Addressing the challenge of capacity building for effective energy policy formulation, analysis and implementation with specific reference to the development of appropriate human resource development, training, and technology acquisition programs for the energy sector.
- *Finance and Markets:* Financing energy investments in Sub-Saharan Africa through the identification of practical ways of securing external financial resources and mobilizing local savings and markets on terms that are not inimicable to the interests of the region and equity aspirations of the region.

Several important lessons that the above experience teaches and that would be of interest to other developing countries are:

- The initial reaction to the introduction of global environment and related response options such as energy efficiency/demand side issues in the energy sector is more often-than-not skeptical.
- Changing the above perspective is not an event but a process that is long-term. In addition, initially emphasis should be placed on showing the tangible and short-term benefits that accrue from initiating energy activities that are end-user oriented and environmentally sound. In effect, greater stress needs to be placed on outlining the "win-win", "no-regrets" and "revenue neutral" options (e.g., reduce import bills while reducing greenhouse gas emissions through improvement in transportation efficiency.) This provides an important incentive that engenders early enthusiasm and support and lays the foundation for developing partnerships that will ensure long-term participation and commitment.
- Whenever possible, environment and related response options such as energy efficiency/DSM should be introduced in existing and ongoing energy programs to minimize disruptions and ensure rapid acceptance.
- Regular and frequent training in energy-related environmental problems as well as appropriate response options such as energy efficiency/DSM is a vital requirement and should be a central component of all energy initiatives in Africa.

The Quest for Middle East Oil: The United States Versus China Scenario

By Mamdouh G. Salameh*

As we approach the twenty-first century, two very powerful geopolitical factors will decisively determine whether the quest for Middle East oil (mainly Gulf oil) could enhance global oil security and, therefore, usher in a period of growth and interdependence in the global economy or could lead to the collapse of the new political order in the Gulf and also instability and conflict in the Asia-Pacific region. The two factors are the United States' growing dependence on Gulf oil and China's growing thirst for oil and the increasingly likely Chinese dependence on oil from the region.¹

So a new United States-versus-China scenario begins to emerge which links global oil security to oil geopolitics in the Gulf and the Asia-Pacific regions. The question is, can these two issues be reconciled.

With the end of the Cold War, the Gulf region has become more important for the United States' national interests. Not only does the region contain 65 percent of the world's proven crude oil reserves, but there is also a growing global and U.S. dependence on Gulf oil. In 1995, more than 35 percent of the industrialized world's oil was supplied by the Gulf. And should current trends hold, the world's dependence on Gulf oil will increase with Gulf producers accounting for a projected 40 percent of the world's oil needs in 2000 and 48 percent in 2010.

Victories in both the Cold War and the Gulf War have helped the United States and its allies gain a substantial degree of oil security. There is very little prospect that Gulf oil will be withheld from international markets in the near future.²

United State Growing Dependence on Gulf Oil

The United States is the biggest consumer of oil in the world accounting for 26 percent of current world production, or nearly 18 million barrels a day (mbd), while itself producing only about 12 percent, or 8.36 mb.³

In 1995, the United States imported 55 percent of its oil needs, or 10 mbd, more than half of which came from the Gulf. By 2000, the United States could be importing 66 percent of its oil needs, or 12.95 mbd, three-quarters of which will also come from the Gulf (see Table 1).

Table 1
United State Crude Oil Imports, 1985-2000
(mbd)

	1985	1990	1991	1992	1993	1994	1995	2000	85-00	% Chg.
Production	10.58	8.92	9.08	8.87	8.59	8.36	8.11	6.65	-37	
Consumption	15.17	16.61	16.85	17.10	17.24	17.75	18.16	19.60	+29	
Total Imports	4.59	7.69	7.77	8.23	8.65	9.39	10.05	12.95	+182	

Source: BP Statistical Review of World Energy, June 1996; IEA; U.S. Information Administration (EIA); Author's calculations.

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¹ See footnotes at end of text.

U.S. Strategy and Objectives in the Gulf

It is not in the United States' national interest and the interest of the region for the Gulf to be dominated by either Iran or Iraq. The primary long-term U.S. objective is, therefore, to preclude such a development.

The Gulf War produced a rough military balance between Iran and Iraq. However the balance between the two, it appears, will soon begin to shift in favor of Iran in view of the harsh UN sanctions against Iraq and Iran's rearmament program.

Iran has embarked on a huge military modernization program and a build-up of military capability. But it is Iran's attempts to acquire nuclear and missile technology that are worrying the United States. The worry is that China could be a source of assistance to Iran having helped Pakistan's nuclear program in the early 1980s.⁴

Asia-Pacific Region's Oil Demand, Supply & Imports

The "center of gravity" of oil consumption is really shifting to the Asia-Pacific region. In 1990, the region overtook Western Europe in oil consumption and if the oil demand trend discernible in the region continues into the future, the Asia-Pacific region is projected to overtake North America (including Mexico) by 1998 to become the world's biggest consumer of crude oil (see Table 2).⁵

Table 2
Oil Demand: North America & Western Europe
Versus Asia-Pacific, 1990-2000
(mbd)

	1990	1992	1994	1995	1996	1997	1998	2000
North America	19.45	19.42	20.31	20.54	20.76	20.99	21.22	21.70
Western Europe	13.27	13.77	13.80	13.93	14.20	14.47	14.74	15.31
Asia-Pacific	13.70	15.26	16.85	17.88	18.97	20.20	21.36	23.54

Source: Authors' projections.

The Asia-Pacific countries are growing increasingly concerned about their ability to supply enough oil to fuel future economic growth. Nowhere are these concerns as manifest as in China. In 1995, the Asia-Pacific region imported 10.9 mbd of crude oil and refined products or 61 percent of its oil needs. By 2000, the region could be importing about 17 mbd or 72 percent of its needs, most of which will come from the Gulf (see Table 3).⁶

Table 3
Current & Projected Oil Demand, Supply and Imports
in the Asia-Pacific Region, 1990-2000
(mbd)

	1990	1993	1995	1996	1997	1998	1999	2000	90-00	% Chg
Production	6.70	6.94	6.98	6.88	6.78	6.67	6.60	6.50	-3	
Consumption	13.70	15.88	17.88	18.97	20.20	21.36	22.66	23.54	+72	
Total Imports	7.00	8.94	10.90	12.09	13.42	14.69	16.06	17.04	+143	

Source: BP; East-West Center, Honolulu, HI, USA; Author's projections.

The China Oil Factor

China's spectacular economic growth has led to a corresponding leap in oil consumption and a growing dependence on oil imports which now account for 12 percent of its oil needs. In 1993, China became a net crude oil importer for the first time. And if China's economic growth continues at

its current pace, it will become the world's third largest importer of crude oil after the United States and Japan. By 2000, China will need to import more than 2 mbd, or 45 percent of its oil needs, if no substantial new oil reserves are found in its territory (see Table 4).

Table 4
China's Crude Oil Production, Consumption and Imports, 1990-2000
(mbd)

	1990	1993	1995	1996	1997	1998	1999	2000	90-00	% Chg
Production	2.79	2.89	2.90	2.82	2.75	2.67	2.58	2.47	-11	
Consumption	2.27	3.09	3.30	3.50	3.70	3.93	4.18	4.53	+100	
Total Imports	0.52	0.20	0.40	0.68	0.95	1.26	1.60	2.06	+296	

Source: BP; China Energy Study, 1995; Author's projections.

One thing, however, is certain. China will be as robust as the United States in defending its access to oil supplies. Furthermore, China may not shy away from the use of force to defend its rights of access. However, to satisfy its needs, China may look to the Middle East, southeast Asia or Siberia. It could trade arms for oil with the Middle East or could use arms to secure oil from southeast Asia, especially from the South China Sea.⁷

It is this growing thirst for oil which is behind China's assertion of its sovereignty over the Spratly Islands and other specks in the South China Sea. The Spratly's which are claimed in whole or in part by China, Vietnam, Taiwan, Malaysia, the Philippines and Brunei, lie atop substantial undersea oil and gas resources estimated by some accounts at 7-130 billion barrels.⁸

However, oil wealth beneath the South China Sea is fueling an explosive arms race in southeast Asia. So the threat of conflict is real. This raises the question as to whether China will risk upsetting its southeast Asian neighbors over the South China Sea when it is trying to attract investment and secure markets. The answer to that question will be determined by the power structure in post-Deng China and also by China's need for foreign investment and technology.⁹

This leaves the Gulf as the other major source of oil supplies for China. China has for years been supplying arms to the Gulf countries especially Iran and Iraq not only as source of hard currency but also in exchange for oil. However, at a time when the United States is trying to prevent both Iran and Iraq from rearming, any attempt by China to sell sophisticated weapons systems to Iran and assist it in acquiring nuclear and missile technology, will incur the wrath of the United States and would prompt it to orchestrate an embargo on oil supplies to China by the Gulf producers and possibly take a preemptive action against Iran's nuclear installations.

Tying China Into the International System

The United States will have to accord a higher priority to the nation most likely to present a challenge in the Asia-Pacific region, namely China. The United States has a special interest in improving relations with China. China is one of two nations (the other is Russia) with the greatest potential either for working with the United States to control nuclear proliferation or for undermining the nuclear control regime possibly through passing nuclear technology to countries like Iran.¹⁰ So a strategy of "positive conditionality" geared towards tying China into the international system and composed of at

least some of the following features, begins to emerge:¹¹

1. China could have access to Gulf oil supplies provided it refrains from transferring nuclear and missile technology to countries like Iran.
2. China is offered high technology from the developed world in exchange for not passing its own nuclear technology to countries like Iran.
3. Provision of foreign technology and investment to China's oil sector will be conditional on its agreement to a peaceful settlement of the territorial disputes in the Spratly Islands and a joint exploitation of the resources in the area.

Conclusions

If China responds positively to the strategy of "positive conditionality," then global oil security (based on Gulf oil supplies) would be enhanced, the new political order in the Gulf strengthened and stability in the Asia-Pacific region assured.

However, there is a remote but disturbing possibility that a post-Deng China may decide to reject this strategy in an attempt to assert its growing weight and independence in foreign affairs. China may then go on to actively pursue its policy of achieving sovereignty over the South China Sea and may also decide to continue its policy of arms for oil with Iran. And should the United States and its allies respond by blocking Gulf oil supplies to China, the Chinese might retaliate by going as far as to assist Iran in acquiring nuclear and missile technology, thus leading to a direct armed conflict between the United States and Iran and the possible mining of the Straits of Hormuz by Iran. In such a dire situation, oil shipments through the Straits of Hormuz could be threatened and global oil security and the new political order in the Gulf would be undermined leading to rocketing oil prices reminiscent of the late 1970s.

Footnotes

¹ Zalmy Khalidzad, "The United States & The Persian Gulf: Preventing Regional Hegemony," *Survival*, Vol. 37, No. 2, Summer 1995, pp. 95-96.

² *Ibid.*, p. 96.

³ *BP Statistical Review of World Energy*, London, June 1996, pp. 7-10.

⁴ Khalidzad, "The United States & The Persian Gulf", pp. 99-106.

⁵ Daniel Yergin & Joseph Stanislaw, "Oil Shines Brightly" (*The World Paper*, Boston, July, 1995), pp. 1-2.

⁶ Mamdouh G. Salameh, "The Geopolitics of Oil in the Asia-Pacific Region & Its Strategic Implications" (A Paper presented to the Energex'96, Beijing, China, June 3-7, 1996), pp. 2-3.

⁷ Gerals Segal, "Tying China Into The International System," *Survival*, Vol. 37, No. 2, Summer 1995, pp. 62-63.

⁸ Michael Leifer, "Chinese Economic Reforms & Security Policy: The South China Sea Connection," *Survival*, Vol. 37, No. 2, Summer 1995, p.44.

⁹ Mark J. Valancia, "China & The South Sea Disputes," Adelphi Paper 298 (Oxford: Oxford University Press for the IISS, 1995), pp. 25-33.

¹⁰ Douglas T. Stuart & William T. Tow, "A U.S. Strategy for the Asia-Pacific," Adelphi Paper 295 (Oxford: Oxford University Press for the IISS, 1995), pp. 4-7 and also pp. 21-23.

¹¹ Segal, "Tying China Into The International System", pp. 70-73.

IAEE New Delhi Conference Promotes Intercontinental Cooperation

The Twentieth Annual International Conference of the IAEE was held January 22-24 at Delhi's Hotel Taj Palace Intercontinental. The conference was organized by the Tata Energy Research Institute (TERI) and the Indian Association for Energy and Environmental Economics (IAEEE) around the major theme, *Energy and Economic Growth : Is Sustainable Growth Possible?*

The conference was attended by approximately 300 participants, with representatives from industry, academia, research and governmental organizations. It was significant in that more than half of the participants were from developing countries. Of the total number of attendees, 41 percent were from India, 35 percent from Western Europe, 11 percent from North America, and 13 percent from other countries, including Uganda, Iran, Ecuador, and Ukraine.

In addition to the objective of presenting the state-of-the-art in the area of energy economics, this year's conference included an additional aim of facilitating interaction between attendees from the developing world and those from developed countries. The chairpersons and speakers in each session were chosen so as to stimulate multi-sided dialogue. Such a perspective to discussion was very important since the world's future energy decisions will have to involve many parties with diverse objectives.

The conference was inaugurated by **Professor Y K Alagh** (Honorable Minister of the State for Planning and Program Implementation, and for Science and Technology, Government of India), who spoke on the role played by economics in recent energy policies of India. With 7 plenary and 30 concurrent sessions spread over 3 days, detailed presentations and discussions were held on a wide range of subjects, including, "Financing Sustainable Development," "Lifestyles and Consumption Patterns," "Hydrocarbon Economics," and "Economic Growth." In addition, each set of concurrent sessions included a business meeting, e.g., a session on "Renewable Energy Technologies," coordinated by **Dr. Murray Cameron**, WIP, Munich, and **Mr. P Venkata Ramana**, TERI, and the "Business Circle on Asia Power," coordinated by **Mr. Assaad Emile Saab**, Corporate Planning Head, Electricite de France, and **Dr. R K Pachauri**, Director, TERI. In these sessions, representatives from around the world had an opportunity to share their thoughts on many issues, and to conceive future transnational interactions in these areas.

Distinguished invited speakers and chairpersons attended the conference, including **Dr. Ali Shams Ardekani**, Secretary General, Iran Chamber of Commerce, Tehran; **Mr. Jan de Beer**, Executive Director (Technology), ESKOM, South Africa; **Mr. John Ferriter**, Deputy Executive Director, International Energy Agency, Paris; **Mr. Paul Hassing**, Senior Staff, Energy and Technology Program, Ministry of Foreign Affairs, The Netherlands; **Dr. Hachio Iwasaki**, Chairman, New Energy and Industrial Technology Development Organization, Tokyo; **Mr. Stephen Karekezi**, Director, African Energy Policy Research Network, Nairobi; **Professor Yoichi Kaya**, Jyukankyo Research Institute, University of Tokyo; **Dr. Vijay Kelkar**, Secretary, Ministry of Petroleum and Natural Gas, Government of India; **Dr. Mohan Munasinghe**, Distinguished Visiting Professor of

Environmental Management, University of Colombo, Sri Lanka; **Dr. Dennis O'Brien**, President, IAEE; **Professor Robert Pindyck**, Sloan School of Management, Massachusetts Institute of Technology, USA; **Mr. Katsuo Seiki**, Executive Director, Global Industrial and Social Progress Research Institute, Tokyo; and **Mr. N Sundararaman**, Secretary, Intergovernmental Panel on Climate Change, Geneva.

The valedictory session included addresses by two prominent leaders in the governments of South Asia. The Presidential Address was given by His Excellency, **Mr. Reggie Ranatunge**, Deputy Minister, Environment Division, Ministry of Transport, Environment, and Women's Affairs, Government of Sri Lanka. The Valedictory Address was delivered by His Excellency **Dr. S Venugopalachari**, Ministry of State for Power and Non-conventional Energy Sources, Government of India.

With several technical and social tours offered in conjunction with the conference, the participants also had the opportunity to experience both modern as well as traditional India in her rich and varied colors. The most popular activities proved to be the three-day Golden Triangle Tour of Delhi, Agra, and Jaipur; a visit to two of TERI's Haryana outstation sites in Gual Pahari and Dhanawas; and an excursion to the Republic Day Parade, held in New Delhi to commemorate India becoming a sovereign democratic republic. Conference evaluation forms received from participants indicate that the theme was thought to be relevant, that the sessions were found useful, and that the organization of the conference was excellent.

The conference was made possible by support from the following organizations: the Indian Oil Corporation (Mumbai) and the Oil Industry Development Board (Delhi), the Indo-German Efficiency Project (GTZ, Germany), the Encyclopedia of Life Support Systems (Abu Dhabi), British Petroleum (UK), Orimulsion (Venezuela), the Hindustan Petroleum Corporation Ltd. (Mumbai), the Bharat Petroleum Corporation Ltd (Mumbai), the UNOCAL Corporation (USA), the Institute of Energy Economics (Japan), and the Ministry of Non-conventional Energy Sources, Government of India.

P. William Reidhead

Business Circle on Asia Power

The *Business Circle on Asia Power* at the 20th IAEE International Meeting in New Delhi was designed to bring together key representatives of the Asian power sector, Asian government bodies and international organizations in order to gain perspectives on the assessment one can have on various organization models, on the functioning of electricity markets and the role of industry players in Asia. It was co-chaired by **Dr. Assaad-Emile Saab**, Corporate Planning Head of Electricite de France (EDF) and **Dr. R.K. Pachauri**, Director of TERI.

The contributions and cross discussion among panelists provided an overview on the state of liberalization and reforms of the power sector in Asian countries, on the uncertainties ahead and the challenges in terms of national and foreign industry involvement and international cooperation.

It was clearly pointed out that not all countries are using the same road map to reform. Some are still wary of private participation in their power industries and of privatizing state assets, but are still pushing ahead with structural reforms. But many other countries, in order to cope with demand growth, are working hard on innovative measures to restructure their power sector and to meet investment needs.

Mr. Dua, Joint Secretary, Ministry of Power, India and M. Roy, Member of the Orissa Regulatory Commission, gave a good illustration with the case of India where significant progress had been made in some states (such as Maharashtra, Orissa, Gujarat, West Bengal) to unbundle the electricity sector in creating separating mechanisms which will encourage the private sector to own and operate generation, transmission and distribution facilities.

The state of Orissa has already moved to privatize electricity distribution. The State Electricity Board has been replaced with a government-owned corporation, and it in turn has contracted with a private company for management of distribution to about half a million customers, including the state capital.

An additional view was provided by Dr. Pacudan from the Asian Institute of Technology on ASEAN countries where the reforms have been triggered by economic liberalization and the dynamic private sector. The result is a major shift to independent power generation, commercialization and privatization of much of the power sector in several of the countries. Opportunities for investment in independent power development exist in all ASEAN countries, what differs is the level of market opening to new entrants.

M. Reyl, Deputy Director of the International Division (EDF), pointed out some lessons on the links between the choice of management options (consulting, twinning, contracting, leasing or privatizing) and the institutional background of a specific country. Among the key lessons, M. Reyl stressed the importance of consensus and trust between key actors, the role of governments in dealing with social problems whichever management option is chosen, and staying pragmatic in avoiding the transfer of an "off-the-shelf" solution from one country to another.

Commenting on some shared figures provided by different international organizations on capital requirements to finance power projects, it was stressed that in the next decade utilities will need US\$35 to 40 billion of investment annually

in power plant and transmission/distribution facilities in Asia. Conventional financing, including loans from export credit agencies and multinational development funds will be inadequate to meet these power sector investment needs. The only alternatives are capital markets, both domestic and international. Ms. Jianling Gay, Chief Economist, State Planning Commission, gave a very illustrative presentation in the case of China, where the power sector in the 1996-2000 period will see installed capacity growing to 290 GW, with 80 GW newly installed.

This will require US\$70 billion which will only partly come from the State budget. Foreign funds are expected to provide around 20 percent. There will be a shortage of US\$12 billion. She also pointed out that due to large pressures on power supply and demand in the very populated eastern and coastal areas (300 million population), which have very little coal resources, nuclear power construction will be the only way to meet the need. She added that foreign investor participation in nuclear projects is strongly encouraged in China.

M. Serusclat, Asia Manager at the International Division of EDF and M. des Rosiers from the International Energy Agency, stressed the importance of the international challenge – mainly the key role of partnerships and associations among international players. M. des Rosiers considered the problem associated with the rapid growth of electricity demand in developing countries and the role of international organizations in promoting guidelines and consensus on environmental consequences of energy use. With regard to the choice of the profile, the nature of the modalities of partnerships, M. Serusclat suggested an integrated strategic approach linking this choice to the market context, the players stakes and business principles.

Considering that the electric power industry is the most vital national sector, the panelists shared the vision that one cannot afford failed experiments in reforms and restructuring. This means that the Asian market is definitely a priority for the western electrical industry and for major multinational organizations and financial institutions in the coming years.

Assaad-Emile Saab

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Conference Proceedings 17th North American Conference Boston, Massachusetts, October 27-30, 1996

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Technology Transfer and National Capacity Enhancement

By Katsuo Seiki*

Up to now, *Environmental Technology Transfer* has shown slower progress than expected, in spite of the global consensus on its importance.

Whatever the environmental issues we face today, it is widely recognized that promoting worldwide application of environmental technologies can be the answer to such issues. For example, the wider application of energy efficient technologies and desulfurization and denitrification technologies available in developed countries may significantly advance the mitigation measures for global warming or acid rain which require immediate world-wide action. The actual deed, however, does not follow the recognition. What can be done to quicken the transition from recognition to implementation?

At the Rio Summit in 1992, the following two issues drew special attention in Agenda 21 discussion on technological cooperation.

First was the provision of preferential and concessional financial assistance offered from the developed countries to the developing countries. Second was the compulsory acquisition of intellectual property rights. In actual debate, the pros and cons of each issue stimulated great contentions between the parties and no clear consensus was reached in spite of heated discussions that continued for more than three days.

It could be that the platform of issues was not really productive. To discuss contentious issues where there are always winners and losers may not be as constructive as the discussion of issues where a win-win situation is possible. An important thing may be that we must not limit the discussion to what roles national governments can take, but rather to consider other stakeholders of environmental issues such as local administrations, international institutions, private sectors, and NGO, and the extent to which they can contribute to the promotion of environmental technology transfers.

Following the Rio Summit, the discussion of environmental technology transfer was conducted on a much broader scope.

First of all, BCSD published the book entitled *Changing Course* around the time of the Rio Summit, stressing its view that cooperation between private businesses through direct investments would be significant in promoting environmental technology transfer. The World Bank and GEF, also, emphasized the importance of market transformation initiatives in recipient countries. TERI's continued efforts have been embodied in its key proposals focused on capacity building in recipient countries. One example of such work with a new viewpoint was the report entitled "Missing Link" jointly prepared by WRI and GISPRI in 1993. It listed the following five items as *fast action initiatives*.

1. Establish a forum for dialogue on technology cooperation,
2. Promote voluntary international standards for environment

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- management and technology cooperation,
3. Expand technology cooperation via networks of globalizing enterprises,
4. Establish innovative intermediation to support technology cooperation,
5. Demonstrate technical and environment capacity building through comprehensive model projects.

These five fast action initiatives may need some elaborating today. But, as premises for effective technology transfers, the following consenses are developing through various studies on environmental technology transfers (cooperation).

First, environmental technology transfers (cooperation) can be implemented in a form of mutual cooperation between private businesses acting as a donor and a recipient. In this case, the key players are in the private sector. The public sector, mainly national governments, takes on a supportive role by facilitating such transactions.

Second, in the financial aspects of environmental technology transfers, the private sector can also take a greater role than the public sector, as its amount of direct investment and other capital investment is many times greater than that from the public sector, such as ODA. Public funds can be seed-money to direct the flow of private sector funds, for example, or more appropriately to finance the areas where it is difficult for private capital to reach.

Third, it is widely recognized that transferable technology needs to be extremely site-specific. Not many of technologies prevailing in the donor's market have established themselves in the recipient's market in the same form. The key point is that the transferring technology must be adaptable to the recipient's market situation, its infrastructure, and distribution of capital and resources. This is the basis of so-called "appropriate technology." Such reasoning has not yet been fully developed, but the only way to determine the adaptability of a certain technology is to examine it, sector by sector and site by site.

Fourth, mere transfer of technology itself will be worthless unless it is packaged with the building of capacities to utilize such technology in recipient countries. One quite convincing argument is that what is transferred through technology transfer is not only the technology itself but the capacity to use it. For the past several years, MITI of Japan has implemented several initiatives for environmental technology transfers exemplified by the so-called "Green Aid Plan." The objective of this plan is to realize the transfer of R&D capacity through the joint development of appropriate technology, as example, in the case of joint research on a simple desulfurization system carried on with the Chinese government. The ultimate goal of National Capacity Enhancement can be the nurturing of local environmental industries. Of course, R&D capacity building itself is not sufficient to meet the ultimate goal. The critical issue can be the commercialization of technologies, leading to the development of local industries in the recipient countries.

Fifth, to build a structure of national regulation and systems in recipient countries it is vital to utilize environmental technology transfers commercially feasible in recipient countries. Sufficient market demand for such technologies and products should be promoted in the recipient market. It is often the case, however, that the demand is suppressed in

the recipient market by low energy prices, lenient enforcement of environmental regulations, and less priority placed on environmental issues among policies and measures. The recipient countries may have already introduced the initiative to transform a market with corrective measures in a particular case. Nonetheless, the extremely important matter is that the recipient countries and their industries will work on these issues of industrialization and capacity building, and present some form of commitment to introduce initiatives and time-tables in the future.

Based on these views, many studies are being carried on today. GISPRI is undertaking a joint study with Japanese experts to develop practical measures for the promotion of environmental technology transfers in the Asia-Pacific region, and hopes to publish the result by July of this year. With the COP III being held in Kyoto this December, the immediate prevailing issue of importance is the progress in implementation of the so-called Climate Technology Initiative. While the conclusion of our study remains to be seen, I would like to propose four areas that require further study.

First is the function of information intermediary. Recently, several important action plans received attention in the provision of environmental technology information, such as Green House Gas TIEs of IEA, and database formulation at UNEP/IETC. Also, in April of 1997, APEC Virtual Center will be opened as a source for environmental technology databases giving easy access to highly professional and specialized information. Regarding the supply of environmental technology information, the field study demonstrated a greater need for "information for proven, established, reliable, and low cost technology" and "information to access relevant technologies." The obstacles in conventional information supply initiatives include inconveniences in accessing information. Furthermore, many issues must be addressed in order to use environmental technology information effectively. Examples include: the accumulation of information necessary for project analysis, such as cost-benefit information and know-how in carrying out projects; the introduction of query and reference functions and consulting services; and the aid to build communication infrastructure in recipient countries.

Second, finance. As I already mentioned, it is necessary to introduce some form of regulatory reform to allow the utilization of multilateral public funds such as ODA and GEF as seed-money to focus the private sector's direct investment.

Another issue in fund procurement is the difficulty of directing funds to the environmental investment of small to medium businesses in developing countries (such as TVEs of China). For this, so called two-step loans such as Japan's Yen Loan can be considered as an effective instrument. Recent examples include around a 5 billion yen loan advanced to the Development Bank of Philippines (DBP) for the prevention of industrial pollution. Based on this loan, DBP offers loans in Philippine pesos as a part of national financial assistance system. Similar measures are planned for other Asian countries. This can be an effective instrument in utilizing public funds.

From a different perspective, there are international mechanisms, such as Joint Implementation, under development through the process of implementing the Convention on Climate Change Mitigation. Joint Implementation can be instrumental as a new channel to increase the flow of funds

in environmental technology transfers. Allowances such as emission rights can be a form of asset for recipient countries, and may induce a new flow of funds based on such assets. Various institutions are conducting studies on this issue in order to determine the most viable emission trading system. There is a compelling need to construct an effective system.

Third, capacity building, especially the issues of education and training. Although many training centers are in operation today, most of their training courses are more generalized training, and focused less on specialized or factory-based training. The Japanese system of national certification examination for pollution control managers may present a valuable insight to this issue.

Environmental management at factories tends to deal with rather site-specific and trivial daily matters. Thus, the right course to take will be the education and training of pollution control managers at factories. Ever since the start of the national examination system to certify pollution control managers, the Japanese government has nurtured such managers and leaders. Today, about four hundred thousand people have already received certification as pollution control managers. As demonstrated in such a system, it will be necessary to tailor the training and education to accommodate the need for trained factory managers.

Finally, the establishment of institutions to provide information access, financial assistance, consulting services, etc., for regions and parties to which environmental technology transfers may be hard to realize if left solely to cooperation between private firms in the area. From Japan's experience, the supportive work introduced by the Japan Environmental Corporation was instrumental in preventing pollution from small to medium firms. It has been pointed out that it is important to establish this type of institution, although various proposals have been made already. (Example: Report of Workshop on *Stimulating Sustainable Markets for Renewable Energy Technologies in Asia/Pacific Region*, 16-18 April 1996). There have been some attempts to establish such intermediary institutions, e.g., the Asia-Pacific Center in India. The important issue is to work for the establishment of such institutions.

Conclusion

The measures I have presented so far are not necessarily exhaustive. The list of action plans can be limitless, by sectors and players. What we actually need is a forum with a certain standing for the Asia-Pacific region to study the measures of promoting environmental technology transfers. In addition to the conventional flow of ODAs from North to South, comprehensive measures of aid and cooperation, including those from South to South are required today. Players involved can be varied, also, from national governments, to private firms, NGOs, international institutions, local administrations, capital market institutions, research institutions, etc. Another matter is that each of these players must tackle issues piecemeal without joining some regional coalition. What we need today is to implement comprehensive measures through a coalition of countries and various players in the countries. Lack of a coordinating forum may be the largest obstacle for the rapid progress of environmental technology transfers. What I would like to propose here is to build such a broader system of coalition.

Meter Readers to Follow the Milkman into Nostalgic Oblivion

By Fereidoon P. Sioshansi*

The walking meter-reader, going from house to house in search of a number to punch into a hand-held device, is heading in the direction of the milkman dropping off fresh milk at the doorstep. And the reason for this evolutionary development is *not* to save the labor cost of walking from meter to meter once a month – as was once advertised by the proponents of *automatic meter reading* (AMR). The reason is that with the proposed restructuring of the electricity retail business, the meter reader has to take a read for an increasing number of customers once every hour, not once a month, and has to get the read to a central data center instantaneously – not in a matter of hours or days, as is currently done. Viewed in this context, AMR will gradually evolve from merely a nice thing to do, to a practical necessity.

This will not be necessary for all customers, of course. Nor will it happen over night – but gradually as happened with the now-extinct milkman in many countries. But as the cost of interval load metering and communications drops, and more and more customers are fitted with the new meters, the cost of reading the remaining customers' meters the old-fashioned way increases. At some point, it might make more sense to replace all the remaining meters and upgrade the network all together because there are many other benefits in doing so. In the short-run, most small customers can get by with their existing meters, and utilities (and competing retailers) will use representative *load profiles* for billing purposes.

The need for AMR is, of course, driven by the desirability to transmit variable energy prices, as determined by the *independent system operator* (ISO) and/or the *power exchange* (PX) to an increasing number of customers. Those who choose to do so, can modify their usage as electricity prices vary from hour to hour, and their response will be recorded and may be reported back to the PX in real-time to keep supply and demand in balance. Moreover, as time goes on, the bills of an increasing number of customers will have to reflect their actual hourly usage (720 per month) and the corresponding prevailing hourly prices. The old-fashioned, electromechanical spinning disk meters simply won't do. They either have to be retrofitted with inexpensive devices that allow the old meters to record hourly data, or in many cases, they may gradually be replaced with new *hourly load meters* (HLMs) that can be remotely read and have built-in two-way communication capabilities. Two-way communication would be particularly desirable for larger customers to transmit variable prices to them, and to report the drop or increase in usage back to a monitoring center (for billing purposes) and possibly to the power exchange (in case of large customers or those on interruptible loads) for purposes of keeping the network in balance.

Of course, once you establish a two-way communication network for AMR, the very same network can support many additional services and functions including *outage detection* and *service restoration*, *service turn-ons* and *turn-offs*, and

*Fereidoon P. Sioshansi is a Senior Consultant with National Economic Research Associates (NERA), San Francisco, CA. This is an edited version of his article that appeared in the February 1997 issue of *EEnergy Informer*.

energy management services. Any why stop there? Why not read the *gas* and the *water meter*; verify credit cards or monitor parking meters, fuel tanks, traffic signals, street lights, security systems, vehicle locations, commercial washing machines, change machines and office equipment; provide home banking and shopping; access to the Internet; home paging – and you name it. Depending on the speed of the communication technology employed, and its range and band-width, the sky could literally be the limit. The question for people in the electricity business is how far to go, and if they decide to go too far, who should they partner with because it requires major investments and it is not clear who will recoup the investment and how.

While utilities and regulators argue over the implementation details of retail access, a number of entrepreneurial companies – some new and some old – are preparing for what promises to be a huge market. There are an estimated 116 million electric meters in the United States alone, with smaller numbers of gas and water meters. Even assuming a modest level of penetration into this market (only eight million are estimated to be fitted with AMR technology today) – and similar developments worldwide – means big business. The current estimated stock of eight million sophisticated meters with AMR capability is expected to more than double by the year 2000.

So what's holding the utilities back from investing in upgrading their meters and establishing the necessary AMR capabilities? The main culprit, as best as we can figure, is uncertainties about who should invest in upgrading the technology, and how to recoup the investment. Under traditional rules, utilities would have gladly made the investments, added them to their rate base, then would have recovered them through higher rates by captive customers. But since it is no longer clear who will serve the customers in the future; (i.e., the traditional utility or some new retailer), it is no longer clear who should make the investment, and who will pay for it. In this environment, utilities (like *Pacific Gas & Electric*) would rather pay a non-regulated vendor, such as CellNet a monthly fee for necessary services instead of investing their own money in the venture, as the CellNet story below explains.

CellNet: The Little Company That Could

Among the aggressive marketers of the new technology is San Carlos, CA - based CellNet Data Systems. CellNet has developed a wireless system for network meter reading that provides instant, continuous readings of residential and business utility meters. CellNet figures that there are more than 230 million utility meters in the US and at least another 600 million in the rest of the world. Even a fraction of this market could keep CellNet busy for years to come. The company had 95 employees at the end of 1994. By the end of 1996, it had grown to 550. Its current customers read like a list of who's who in the U.S. utility business: PG&E, Kansas City Power & Light, Union Electric Co., Northern States Power Co., and Puget Power. The deal with PG&E, announced in November 1996 is typical: a 10-year contract for CellNet to install and operate a system serving about 100,000 meters – 55,000 electric, 45,000 gas – in PG&E's Delta District in eastern Contra Costa County in Northern California.

According to John M. "Mick" Seidl, CellNet president and chief executive officer, "Installation has begun and

should be complete by mid-1997." Like the technology employed by Itron, Metricom, and a few other vendors, meter reads from CellNet's meters are continuously transmitted on CellNet's radio frequency to a nearby pole-top controller, which collects data from meters within about a one-tenth- to one-quarter-mile radius. The controller in turn relays the data to a tower-mounted device called a cell master, which collects data from controllers within about a 2-to 5-mile radius and transmits that data over CellNet's radio band to the system controller, which is connected to the utility company's customer information and operation center. The company invests in the network and maintains it in exchange for a monthly service fee, generally \$1 per month per meter. The PG&E contract for 100,000 meters will produce about \$8 million to \$10 million in revenue over 10 years.

That should make CellNet hugely profitable? No so. As it turns out, the company's cash flow looks pretty dismal and even the company's rosy PR people admit that profitability is at least five to six years away. The reason is that the AMR business is an expensive, up-front infrastructure investment business. You have to build the network first before revenues from monthly customer reads begin to come in. CellNet, however, is optimistic.

Conference Proceedings Transport, Energy and Environment Elsinore, Denmark, October 3-4, 1996

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Asian Energy News. Monthly press review. Price: \$100.00. Contact: Center for Energy-Environment Research & Development, Asian Institute of Technology, PO Box 4, Klong Luang, Pathumthani 12120, Thailand. Phone: 66-2-524-5425. Fax: 66-2-524-5441. E-mail: lefevre@ait.ac.th

Reinventing Electric Utilities: Competition, Citizen Action, and Clean Power. (1997). 239 pages. Price: \$34.95. Contact: Island Press, Box 7, Dept. 2PR, Covelo, CA 95428. Phone: 202-232-7933. Fax: 202-234-1328.

Cogeneration & Power Marketing Monthly. Monthly newsletter. Price: \$294.00. Contact: COGEN Publications, PO Box 2303, Falls Church, VA 22042. Phone: 703-641-0613. Fax: 703-641-9265.

The Economics of Global Warming. (1997). 656 pages. Price: \$195.00. Contact: Edward Elgar Publishing, Inc. PO Box 330, Lyme, NH 03768. Phone: 603-795-2282. Fax: 603-795-2818. E-mail: kwright@e-elgar.com

Conservative Environmentalism: Reassessing the Means, Redefining the Ends. (November, 1996). 296 pages. Price: \$59.95. Contact: Greenwood Publishing Group, 88 Post Road West, PO Box 5007, Westport, CT 06881-5007. Phone: 203-226-3571. Fax: 203-222-1502.

Energy Outlook. (February 1997). NZ\$40. Contact: Conrad Edwards, Unit Manager, Energy Modelling and Statistics Unit, Ministry of Commerce, 333 Bowen Street, Wellington, New Zealand. Phone: 64-4-472-0030. Fax: 64-4-473-9930.

Energy Greenhouse Gas Emissions 1990-1995. Price: NZ\$45. Contact: Conrad Edwards, Unit Manager, Energy Modelling and Statistics Unit, Ministry of Commerce, 333 Bowen Street, Wellington, New Zealand. Phone: 64-4-472-0030. Fax: 64-4-473-9930.

Calendar

8-10 May 1997, Middle East Oil & Gas: Towards the Third Millennium. Abbasi Hotel, Isfahan, Iran. Contact: Conference Organizing Committee, Room: 1102-1, NIOC Main Bldg., PO Box 1863, Tehran, Iran. Phone: 9821-6152599. Fax: 9821-6466961.

25-29 May 1997, 8th Global Warming International Conference & Expo. New York, New York, USA. Contact: Global Warming International Center, PO Box 5275, Woodridge, IL 60517. Phone: 630-910-1551. Fax: 630-910-1561.

2-3 June 1997, Oil, Gas & Power: New Opportunities from Latin America's Booming Energy Industries. La Jolla, California, USA. Contact: Institute of the Americas, 10111 North Torrey Pines Road, La Jolla, CA 92037. Phone: 619-453-5560. Fax: 619-453-2165.

(continued on page 32)

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

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9-13 June 1997, Inside Washington: Business and Public Policy - Focus on Energy and Environmental Policy. Washington, DC. Contact: Karen Akers, The Brookings Institution, 1775 Massachusetts Ave., NW, Washington, DC 20036-2188. Phone: 202-797-6268. Fax: 202-797-6133. E-mail: kakers@brook.edu

16-27 June 1997, Second International Training Program on "Utility Regulation and Strategy." Gainesville, Florida. Contact: Pascale Parker, Program Coordinator, PURC, PO Box 117142, Matherly Hall 205, University of Florida, Gainesville, FL 32611. Phone: 352-392-6148. Fax: 352-392-7796. E-mail: purcecon@dale.cba.ufl.edu URL: <http://www.cba.ufl.edu/eco/purc>

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

2-4 July 1997, European Conference: VEE, EFCEE and IAEE: "The Integration of Central European, Baltic and Balkan Countries in the European Energy Economy." Vienna. Contact: Peter Vander meiren, EFCEE, 35 Electriciteitsstraat/1105, B-2800, Mechelen, Belgium. Phone/Fax: 32-15-20-48-57.

14-16 July 1997, Oil and Gas Education Initiative. Dallas, TX. Contact: Mr. Allen Mesch, Director, Maguire Oil and Gas Institute, Edwin L. Cox School of Business, Southern Methodist University, PO Box 750333, Dallas, TX 75275-0333. Phone: 214-768-3692. Fax: 214-768-3713. E-mail: amesch@mail.cox.smu.edu

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

12 September 1997, Energy and Security in Asia. Massachusetts Institute of Technology. Contact: Michael Lynch Phone: 617-253-5806. Fax: 617-253-9330.

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.

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

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

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

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>)

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

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

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