

IA INTERNATIONAL ASSOCIATION FOR ENERGY ECONOMICS

EE Newsletter

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

Winter 1996

President's Message



I take over the Presidential reins from Kenichi Matsui and his predecessors with a great deal of optimism.

The Association is financially solvent and well-managed, thanks in large part to the efforts of our professional managers, AMS, Inc., and of recent IAEE Councils. This happy state allows the Council to turn to long-term issues.

I have personally set three broad objectives for my tenure as President:

- Improve services to our members. We will be sending a questionnaire soliciting comments on services in the near future.
- Increase our membership in three areas:
 1. Broaden our membership to include more members in the financial, academic and policy areas.
 2. Extend our membership coverage in emerging energy markets. Three-quarters of our members are from industrialized countries. Outside of Japan, only 5 percent of our members are in Asia, the fastest energy growth area.
 3. Widen our membership among our current country participants. While it is true that the IAEE has members in almost 70 countries, only half the countries exceed the membership for affiliate status, and only 10 countries have more than 100 members each.
- Develop and implement a long-range plan for the Association. I have arranged and will chair a number of planning sessions to this end.

1996 will mark two major conferences of the IAEE. I urge your participation in May when we will hold our first international conference in Eastern Europe - in Budapest, Hungary. The theme, *Global Energy Transitions: With Emphasis on the Last Five Years of the Century*, will bring together industry and government leaders in emerging energy markets. In Boston, the October North American USAEE/IAEE meeting will focus on *Deregulation of Energy*.

In addition, we will jointly support a regional meeting in Denmark, as well as remain sponsor of the important RIIA/BIEE/IAEE Chatham House conference in early December. All these conferences will offer a treat to energy economists.

I wish you all best wishes and a prosperous New Year. See you in Budapest!!

Tony Finizza

Election Results Announced

Past President and Chairman of the Nominating Committee, Fereidun Fesharki, has announced the results of the Association's 1996 elections, conducted last fall. Elected were the following:

President-elect	Dennis J. O'Brien
Vice President and Secretary	Leonard L. Coburn
Vice President for Conferences	Arild N. Nystad
Vice President for Publications	Peter Pearson

Dennis O'Brien is Chief Economist of Caltex Petroleum, based in Dallas, Texas. He formerly was Deputy Assistant Secretary for International Oil & Gas and Senior Petroleum Officer, U.S. Department of Energy. Prior to that he was with the U.S. General Accounting Office. He taught at California State University, the University of Missouri and Missouri State University. O'Brien holds BA and MA degrees from the University of Nebraska and a PhD from the University of Missouri. He is a past president of the

(continued on page 3)

Editor's Note

We're pleased to present a number of timely and interesting articles in this issue. Peter Pearson begins the issue with an article on Electric Power, Emissions and Economic Development in which he focuses on the relationships between these factors. Next, William Edwards looks at

(continued on page 16)

Contents: President's Message; Election Results p 1 • Electric Power, Emissions and Economic Development p 4 • Notes from Belarus Workshop p 7 • Analysis of OPEC/Non-OPEC Cooperation p 8 • The Changing Politics of International Energy Investment p 10 • IAEE International Conferences p 14 • Energy Transition in Eastern Europe and the CIS p 16 • Technology: Servant or Master? The Nuclear Conundrum p 17 • Energy-The Key to an Ecologically Sustainable Development p 22 • The IEA Gas Security Study p 23 • Corrections and Amplifications p 25 • Privatization of the Hungarian Energy Industry p 26 • Should Oil States Hedge Oil Revenues? p 28 • Publications; Calendar p 30..

Plan to Attend
19th IAEE International Conference

GLOBAL ENERGY TRANSITIONS - WITH EMPHASIS ON THE LAST FIVE YEARS OF THE CENTURY

March 27-30, 1996 - Budapest, Hungary
Hyatt Atrium Hotel

Overview

You are cordially invited to attend IAEE's 19th International Conference to be held in Budapest, Hungary, May 27-30, 1996 at the Hyatt Atrium Hotel. This year's theme is *Global Energy Transitions - With Emphasis on the Last Five Years of the Century*. The IAEE is the largest association of energy economists in the world and holds an annual international conference each year. These conferences have gained wide-spread respect for providing timely energy economics information as well as bringing together some of the world's leading energy experts, thus creating a forum for enriched dialogue and networking within the field. Mark this conference on your calendar and plan to attend. This is surely one event you will not want to miss.

Program

The program is designed so that you will come away with a better sense of energy supply, demand, and policy. General sessions include:

Energy Policies of the Last Five Years	Regional Transitions
Energy Industry in Transition in Eastern Europe & FSU	Sufficient Energy Supply at Falling Prices?
The Outlook for Nuclear Power in Eastern Europe	Conservation
Energy Privatization in Central Europe: Strategies, Results and Outlooks	Environment: Regional and Global

Three business circles will address: *Upstream Opening Up of Russian and Caspian Sea Petroleum Sector*, *Energy Financing in East Europe*, and *Pipeline Transportation and Geopolitics*. Further, 25 Concurrent Sessions are planned to address timely topics. These will involve worldwide presenters on virtually every aspect of energy.

Speakers

Many of today's top energy experts will address this conference. Below is a partial listing of some of the speakers.

Ruud Lubbers	Lee Schipper	Ministers of Hungary and Russia	P. Barnevik
W. Czernie	Guy F. Caruso	Peter A. Davies	Anthony Finizza
Ulf Hansen	D. Keith	Rilwanu Lukman	Jean Masseron
M. Munasinghe	N. Niehaus	Arild Nystad	Dennis J. O'Brien
R.K. Pachauri	John P. Ferriter	Klaus Brendow	Charles Ebinger
Roger Boissler	Fereidun Fesharaki	G. C. Watkins	Paul Tempest
	Juan Elbenschutz		

Registration

Budapest, Hungary is a wonderful place to meet and at affordable prices. Single nights at the Hyatt Atrium Hotel are DEM 220. The conference registration fee is DEM 565 for IAEE members and DEM 700 for non-members. In addition, several technical tours have been added for nominal fees. Several social events are included in the registration fee. The meeting venue offers a wide variety of restaurants, shopping opportunities, and Hungarian folklore programs as well as a setting to network with colleagues both new and old. Please note that in 1996, Hungary celebrates the "Millecentenarium" (the 1100 anniversary) of the conquest of the Danube Valley by Hungarian forefathers. The whole year will be festive and every day offers special artistic and cultural events.

For a complete program flyer and registration forms please fill out the following form and return it to either of the addresses below.

Name: _____

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Mail form to: CONGRESS, Ltd.
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or IAEE Headquarters
Budapest Conference Information
28790 Chagrin Blvd., Suite 210
Cleveland, OH 44122, USA
Phone: 216-464-5365

Elections (continued from page 1)

United States Association for Energy Economics and was IAEE Council's General Conference Chairman from 1989-92. He was General Conference Chairman of the 1995 18th International Conference in Washington, DC and the 1994 North American Conference. He is a Senior Fellow of the USAEE and the Institute for the Study of Earth and Man. He is a member of the U.S. National Committee for Pacific Economic Cooperation and the Energy and Minerals Forum as well as the Editorial Boards of the *Journal of Energy Finance and Development* and the *Journal of Petroleum Finance and Accounting*.

Leonard Coburn is Acting Deputy Assistant Secretary for Energy Supply Policy and Director of Oil Policy, U.S. Department of Energy. Coburn holds a BA from Cornell University, a JD from Northwestern University School of Law and an LLM from George Washington University. He was formerly Director, Office of Competition, U.S. Department of Energy and a Trial Attorney, Antitrust Division, U.S. Department of Justice. Coburn has been active in the USAEE and Treasurer, Secretary and Vice President, Chapter Liaison. He is a past president of the National Capital Area Chapter of the USAEE and was Arrangements Chairman of the 1995 Washington International Meeting. He is a member of the Federal Energy Bar Association and the Economic and Business Historical Society and has been active in the Transportation Research Forum.

Arild Nystad is Director, Petroleum Resource Management Division, The Norwegian Petroleum Directorate. He holds a MSc and a Phd from the Norwegian Institute of Technology and a Postgraduate degree in Petroleum Engineering and Petroleum Economics from Ecole Nationale Supérieure du Pétrole et de Moteurs. Formerly he was Chief Scientist at the Centre for Petroleum Economics at Chr. Michelsens Institute and Scientist at Continental Shelf Institute, both in Norway. Nystad was instrumental in the establishment of IAEE's Norwegian affiliate.

Peter Pearson is Principal Research Fellow at the Centre for Environmental Technology, Imperial College of Science, Technology & Medicine in London and a Visiting Reader in the Department of Economics, University of Surrey. He holds a BA from the University of Keele, a MSc from the University of London and a PhD from the University of Surrey. Formerly he was Director, Surrey Energy Economics Centre, University of Surrey, an ESRC Global Environmental Change Research Fellow, Research Officer and Lecturer in Political Economy at the University of Glasgow and a Senior Visitor of the Cambridge University Energy Research Group. Pearson is a past Chairman of the British Institute of Energy Economics and a co-organizer of several joint BIEE/IAEE/RIIA conferences. He has served in various capacities on Council since 1989. He is a member of the European Association of Resource and Environmental Economists, the Royal Economic Society and the Scottish Economic Society as well as a member of the editorial boards of *Energy Economics* and *Energy Policy*. Pearson is a cofounder of the Third World Energy Policy Study Group.

Coburn, Nystad and Pearson will all be serving their second two year term in their respective capacities under Anthony Finizza who has moved up to the Presidency from President-elect.

UNITED STATES ASSOCIATION FOR ENERGY ECONOMICS INTERNATIONAL ASSOCIATION FOR ENERGY ECONOMICS *Announces*

The 17th Annual North American Conference

"(De)Regulation of Energy: Intersecting Business, Economics and Policy"

To Be Held At The

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Boston, Massachusetts, USA
October 27-30, 1996

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Restructuring of the Utility Industry
New Methods of Environmental
Regulation
Energy Reform Overseas:
Experience & Potential
Energy and Security: Is the Battle Won?
Advances in Finance (Theory and Practice)

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The New Politics of Energy Policy
Determinants of Fuel Choice
The State of the Environment
Reform of National Oil Companies
Orphans or Accessories: Stranded
Assets, DSM, & Renewables

CALL FOR PAPERS and POSTER SESSION

Deadline for Submission of Abstracts: May 3, 1996

Anyone interested in organizing a session should propose topics, motivations, and possible speakers to Mike Lynch - 617-253-5806

Abstracts should be between 200-1500 words giving an overview of the topic to be covered at the conference. At least one author from an accepted paper must pay the registration fees and attend the conference to present the paper. Please indicate if you are NOT willing to participate in the Poster Session. All Abstracts/Proposed Sessions and Inquiries should be submitted to:

David Williams, Executive Director
USAEE/IAEE
28790 Chagrin Blvd., Suite 210, Cleveland, OH 44122
USA
Phone: 216-464-2785; Fax: 216-464-2768

General Conference Chairman: Kathleen B. Cooper
Program Chair: Michael C. Lynch
Arrangements Chair: David L. Williams

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Electric Power, Emissions and Economic Development

by Peter Pearson*

Energy use in the developing world has been growing rapidly over recent decades, both absolutely and relative to the growth in industrialized countries albeit from a very low base. In the next century, developing country commercial energy consumption in general, and electricity consumption in particular, is expected to continue to rise with striking rapidity because of population growth, income growth and substitution of modern commercial fuels for traditional biomass fuels. Because the power sector is one of the fastest-growing energy sectors, it raises significant domestic environmental issues, while the sector's role in global warming scenarios has made it a key feature of international environmental policy. This paper focuses on the relationships between economic development, electric power and polluting emissions.

Historically, developing country electricity consumption showed a 1971-90 growth rate of over 8 percent per year, more than twice as fast as that of the corresponding OECD rate of 3.5 percent per year. A range of scenarios for the 21st century has suggested that although electricity demand growth could continue its recent deceleration in both industrialized countries and developing countries, the developing country rate is likely to fall much more slowly.¹ Consequently, the developing country share in world electricity consumption – and global CO₂ emissions – is set to rise and to dominate the industrialized country share through the next century. Over the nearer term, a 1990 study of electric utility expansion plans in seventy developing countries indicated that electricity demand was expected to grow at an average rate of 6.6 percent per year in the 1989-99 period, with total capacity additions of more than 380 GW, raising installed generating capacity, by more than 80 percent.² Asia accounted for more than 60 percent of these requirements, Africa for less than 2 percent. The US\$745 billion (1989 dollars) of capital expenditure plans were dominated by coal thermal (44 percent), hydro (36 percent) and gas thermal (10 percent). In terms of electricity supply, coal was planned to provide almost one half, while hydro would provide a little less than one third. Coal use would nearly double in volume (bringing significant increases in both domestic and global pollution). And, although funding difficulties experienced by electricity utilities in many developing countries mean that plans are not always fully realized, developing country electricity supplies and their associated environmental impacts are still likely to grow with striking rapidity over the next several decades.

The Sources of Present and Future Electricity Demand

Electricity demand grows with population and with the changing nature, location, level and composition of economic and social activity. Mechanization, industrialization and urbanization are, of course, key factors. So also are

*Peter Pearson is Principal Research Fellow at the Centre for Environmental Technology, Imperial College of Science, Technology & Medicine, London, England. This is an edited version of his talk given at the IAEE 18th International Conference, July 5-8, 1995, Washington, DC.

transitions to electricity, both from the direct use of fossil fuels and from dependence on biomass fuels (the latter, of course, present their own patterns of environmental impact – on health, through indoor air pollution, and in situations of unsustainable use, on various forms of natural resource degradation).

For those who have access to and can afford electricity and electrical appliances, there are major impacts on the quality of life. However, despite the fact that over the past twenty or so years installed capacity and per capita generation in most of the large developing countries grew more than twice as fast as real GDP, while power connections grew at about two and half times the population growth rate, still only a relatively small proportion of developing country populations are connected to electricity supplies.³ Moreover, per capita consumption is a fraction of industrialized country levels (average per capita electricity generation in developing countries is 660 kwh, compared with 10,500 kwh in the USA and about 6,000 kwh in OECD, Japan and Europe⁴). It is clear that there is massive latent demand for electricity in developing countries, with all that this implies for economic and social development and for the growth of domestic and international environmental impacts.

Local, Regional and Global Environmental Impacts

Given the expected growth in electricity generation, it is clear that in the absence of major changes in pricing, management, fuel choice and technology, the environmental impacts associated with electricity will grow very rapidly indeed. A number of scenarios for 1990-2030, relating to the expansion of electricity supply in developing countries were prepared by Anderson and Cavendish for the 1992 *World Development Report*.⁵ The 'unchanged practices' scenario, in which pollution abatement technologies are not widely used, suggests that the emissions index of three regional and local pollutants (particulate matter, SO₂ and NO_x) rises exponentially at about 6 percent per year, with the result that emissions increase more than fourfold in the twenty years between 1990 and 2010 and tenfold over the forty years between 1990 and 2030. Other types of environmental impact are also likely to grow commensurably.⁶

For global pollution, given the projected role of fossil fuels, especially coal, in future electricity generation scenarios, and given the rapid growth in the transport sector, it is no surprise to find projections of rapid increases in future developing country CO₂ emissions. Numerous scenarios have shown the developing countries' share in global emissions rising from less than 30 percent in 1990 to well over 50 percent by the second half of the 21st century, with the growth in fossil fuel generated electricity being a significant part of this.⁷

Electricity Services and Environmental Quality?

The question then arises whether developing nations can simultaneously pursue *both* the increased electricity services they want and need and also achieve tolerable levels of emissions and environmental quality. One answer is to say 'yes', where there exist exploitable 'no regrets' *energy efficiency* measures, and especially where there exist exploitable 'win-win' *economic efficiency* measures, such as the

¹ See footnotes at end of text.

pursuit of efficiency in electricity pricing and in the structure, management and regulation of electric utilities. This suggests a degree of complementarity between electricity services and environmental quality. However, there is a need for caution, since greater technical energy-efficiency may even lead to increased electricity consumption and pollution – in many situations, people may simply demand a wider range of cheaper energy services, as the history of the industrialized countries has shown.

Anderson and others have argued, however, that if energy efficiency is pursued according to the principles of economic efficiency, pollution emissions from electricity in developing countries could fall by one-third (possibly more) relative to trend levels, and economic growth could also rise, ‘liberating’ resources that could be allocated to other urgent priorities, such as water supply, health or education. The potential for improved efficiency in the developing country power sector seems considerable. The World Bank’s 1993 power sector review paper said that over the period 1979-88, average real power tariffs in developing countries declined from 5.2 cents to 3.8 cents/kwh, quality of service deteriorated, technical and nontechnical losses and fuel consumption remained high, and poor maintenance of plants persisted. Moreover, the *World Development Report 1992* asserted that: “Prices, on average, are barely more than one-third of supply costs and are half those in industrial countries. ...developing countries use about 20 percent more electricity than they would if consumers paid the true marginal cost of supply. Underpricing electricity also discourages investment in now, cleaner technologies.”

It seems reasonable, therefore, to argue that in many developing country power sectors there is significant potential for efficiency reforms which would also yield sizable environmental benefits. However, this needs to be tempered by the acknowledgment that these hypothetical efficiency gains may not be so easy to achieve in practice, given the complex, multi-faceted and multi-obligated nature of public ownership and decision-making in many parts of the developing world. For example, one of the most obvious outcomes of the U.K.’s recent energy privatization programs has been the striking reductions in the workforce in the power sector – employment in the two main generators, National Power and Powergen, has tumbled by more than half since 1990. The short to medium term employment and other implications of recommended power sector reforms in developing countries will pose a serious policy problem for many governments.

Are Economic and Energy Efficiency Sufficient for Long Term Environmental Quality?

The question arises whether even the aggressive pursuit of economic and energy efficiency in the power sectors of developing countries would be sufficient on its own to restrain the growth of environmental impacts. Anderson has argued convincingly that the effects of efficiency on energy use and pollution will differ significantly between the industrialized countries and the developing countries – and in the Anderson and Cavendish 2030 scenarios for particulate matter, SO₂ and NO_x, it is the additional substitution towards low-polluting practices and technologies and fuels (induced by targeted environmental policies and ‘appropriate incentives’) that has the decisive impact on pollution abatement. For a number of

the domestic air pollutants, such as particulates, abatement or low-polluting technologies are available and add a relatively small percentage to total costs. In other cases, such as flue-gas desulphurization, or for some alternative fuels, costs are at present somewhat higher.

Thus, pollution abatement is possible but efficiency alone is not enough; high levels of control would require positive decisions to devote – and, significantly, divert – scarce resources. Therefore, simply in order to address the *domestic* environmental impacts of the power sector over the longer term, developing countries will be faced with a need to decide how important environmental quality is relative to other policy objectives, and what resources they are willing and able to deploy to achieve it, in the light of their estimates of the costs and benefits of doing so. It has become fashionable to suggest that the ‘Environmental Kuznets Curve’, with its inverse U-shaped relation between some environmental quality indicators and per capita GDP, implies that all serious environmental problems will automatically be addressed as economic development proceeds. This dubious proposition is based on an empirical construct that requires deeper and more searching examinations than it has yet received.⁸

The Threat of Global Warming?

For global environmental issues, such as those raised by CO₂, at present poor nations have found it inappropriate to prioritize long-term emissions abatement measures over output and consumption. Modelling exercises have tended to confirm that developing countries with significant fossil fuel resources, such as China and India, with their big coal reserves, could face high levels of loss from CO₂ abatement policies. This is because adjustments to carbon constraints tend to require expensive imports of lower-carbon or noncarbon fuels and technologies, and in any case, raising exports to pay for them tends to augment fuel demand and emissions. However, without a switch away from fossil fuels in general and coal in particular, there seems little prospect of restraining significantly the growth of developing country and hence world CO₂ emissions.

The development needs of many developing country governments make it difficult for them to accept a trade-off of reductions in uncertain, long-term global environmental damage against their plans for short to medium-term economic growth and development. Consequently (and, of course, for strategic bargaining reasons), they tend to argue for compensation and technology transfer to persuade them to adopt the targets of industrialized countries – a position that was reflected in the FCCC at Rio and in the 1995 Conference of Parties in Berlin. Both Rio and Berlin showed that serious questions remain over what greenhouse gas emissions targets should be, who should meet them, and whether accommodations can be reached on targets, finance and technology transfer.

A New Role for Renewables?

It has been argued that, without the further adoption of low-polluting fuels and technologies, economic and energy efficiency will not be sufficient to restrain developing country emissions of domestically damaging air pollutants. Moreover, if it were thought desirable to go for major carbon-

(continued on page 6)

Electric Power...(continued from page 5)

abating strategies, a switch towards a lower CO₂-emitting fuel, like gas, even were it feasible, would not be sufficient to achieve substantial abatement targets. For various reasons, and notwithstanding its adoption in some of the more rapidly growing Asian economies, a large-scale switch to nuclear electricity in the developing world does not seem a plausible solution. In the absence of successful alternative carbon-removing technologies, and in the event that an apparently significant carbon constraint emerges as an international political reality, the key question will then be whether renewable technologies, particularly photovoltaics, solar thermal and biomass, can develop as successful non-net-carbon-emitting backstop technologies.⁹ Anderson has argued that for electricity generation the backstop renewable technologies may even eventually become competitive with fossil fuels, at least in the high insolation areas of the world.

As well as their current limitations, primarily of cost competitiveness with fossil fuels in many existing situations, renewables also have some potential advantages. There are some attractions to smaller-scale local systems, particularly when the necessity and desirability of large single utilities providing power is being increasingly questioned, and when, as CCGT has shown, scale economies need no longer dominate and mean that only big can be beautiful. Moreover, in many developing countries the terrain and population densities are such that the expansion of grid systems to satisfy small loads is very expensive. In Kenya, for example, for low loads, such as lighting, radios and televisions, small-scale photovoltaics have been shown to be commercially competitive with rural electrification via a centralized grid. This has happened even in the presence of high import duties (amounting to more than 30 percent of the final price paid) and in the absence of credit facilities: around 20,000 households have bought solar energy, compared with the 17,000 connected to the official rural electrification program.¹⁰ Local environmental issues are another matter. Exchanging one fuel and technology for another does not abolish, but changes, the pattern of environmental impacts. There are clearly circumstances in which, for example, renewables would not cause the same types of local environmental and social disruption as those associated with some large-scale hydroelectric schemes. On the other hand, there could be significant ecological and other impacts associated with any new, large-scale biomass growing programs.

An important question is whether renewable technologies can develop at the same rates as those which the now-commercial technologies of thermal generation achieved, and how many resources and how long it might take to get to competitive cost levels. Proponents of renewables point to the significant reductions in the costs of photovoltaic and other technologies and compare them with the experience of now-mature fossil-fuel technologies. Anderson quotes long-term expectations of the costs of large-scale use of renewables in electricity generation ranging from 4-6 US cents/kwh (at 1990 prices), while acknowledging present costs ranging from 9-50 cents/kwh. He also stresses the contributions that might be made by current investment to reducing the costs of future investments through combinations of induced innovations and 'learning by doing,' citing as examples the experience of the electricity industry over much of this century,

when costs fell twenty-fold over the sixty years from 1900, and the thermal efficiencies of power plants rose ten-fold. It is argued that while the contribution of current investment to reductions in the unit costs of later investment may not be large, the overall benefits of investing in and developing a technology can be substantial if the prospective use of the technology is big – it is the product of the two effects that matters. Any such positive externalities of falling costs, imply benefits that would not be fully captured by current private investors, but which should be included in a social project appraisal (although it would also be essential to take into account the possibility of falling costs in conventional non-renewable generating technologies). The existence of such externalities would also lend support to an argument for governments to devote resources to enhance the development of appropriate renewable technologies.

If it were decided to do this, the problem of the inability of governments to 'pick winners' suggests that a diversified portfolio, including non-renewables, would spread the risks. In the past, for example, governments have tended to respond to energy security problems by selecting and supporting effectively single-technology strategies (such as the U.K.'s past focus on support for R&D and investment in nuclear electricity).

Thus, a question that needs investigating in more depth is whether, given the possibility of a need to take strenuous action to restrain carbon emissions and also given the size of potential markets for small and large-scale electricity generation technologies in developing countries in the 21st century, there might be a coming-together of diverse interests – industrialized country and developing country governments and international and local suppliers of new technologies – which could lead to the development of less locally and globally environmentally-damaging electricity services in developing countries.

Cooperation, partly on the basis of anticipated gains from trade, seems a lot more attractive than conflict. The possibility of falling costs might well spur on the activities of commercial organizations attracted by the prospect of an international market that could be very big in the presence of significant carbon constraints and, even in their absence, could form a sizable market for cost-effective electricity in situations where standard technologies, fuels or distribution systems tend to be problematic. More than this, in his observation about lighting in Africa, Robert van der Plas reminds us why electricity matters: "The level of services many rural households 'enjoy' now is only barely distinguishable from that of medieval Europe."¹⁰

Footnotes

¹ For example: Eden, R. (1993), 'World Energy to 2050: Outline Scenarios for Energy and Electricity, *Energy Policy*, 21(3); Energy Information Administration (1995), *International Energy Outlook 1993*, U.S. Department of Energy, Washington, DC. See also his paper on 'Electricity and Environmental Policy' in the Conference Proceedings.

² Moore, E. A. and Smith, G. (1990), *Capital Expenditures for Electric Power in the Developing Countries in the 1990s*, World Bank, Washington, DC.

³ World Bank (1993), *The World Bank's Role in the Electric Power Sector*, World Bank, Washington, DC.

⁴ Energy Information Administration (1995), op. cit.,

note 2.

⁵ Anderson, D. and Cavendish, W. (1992), 'Efficiency and Substitution in Pollution Abatement: Three Case Studies,' *World Bank Discussion Paper No. 186*, World Bank, Washington, D.C., World Bank (1992), *World Development Report 1992*, CUP, Oxford.

⁶ See, for example, Brandon, C. & Ramankutty, R. (1993), *Toward an Environmental Strategy for Asia*, World Bank Discussion Paper 224, Washington, DC.

⁷ See also Pearson, P.J.G. (1993), 'The Environmental Impacts of Electricity Generation in the Third World,' *IEE Proceedings-4, Science, Measurement & Technology*, 140 (1), 100-108.

⁸ Pearson, P.J.G. (1994b), 'Energy, Externalities and Environmental Quality: Will Development Cure the Ills it Creates?', *Energy Studies Review*, 6(3).

⁹ For detailed arguments, and estimates of the role of renewables as non-net-carbon-emitting backstop technologies, in the context of proposed projects for the Global Environmental Facility, see Anderson, D. (1994), 'Cost-Effectiveness in Addressing the "CO₂ Problem," *Annual Review of Energy and Environment* 1994, 19.

¹⁰ van der Plas, R. (1994), 'Solar Energy Answer to Rural Power in Africa', FPD Note 6, World Bank, Washington, DC.

Waverman Appointed to Ontario Advisory Committee

Leonard Waverman, editor of *The Energy Journal*, has been appointed to the seven member Advisory Committee on Competition in Ontario's Electricity System.

The committee is to evaluate options for increasing competition and competitiveness in the Ontario, Canada electric utilities system. Specifically, the committee is to examine options in (1) structural changes to the electric utility industry, (2) regulatory reform to ensure a healthy competitive environment and (3) introduction of private equity in the electric utility sector.

The committee, chaired by former Privy Council President Donald S. Macdonald, is expected to report to the Minister of Environment and Energy in the spring of 1996.

Problems of Efficient Energy Supply and Consumption and Development of a New Energy Policy in East European Countries

Notes from Belarus Workshop of 4-6 October

This East European workshop was held at the German-Byelorussian Educational Centre with support from the Belarus Ministry of Fuel and Power Engineering, the Academy of Sciences of Belarus, the European Foundation for Cooperation in Energy Economics, the IAEE and the IAEE Byelorussian Affiliate.

Over 200 representatives of energy companies, research institutions, universities and other organizations took part in the workshop with individuals coming from Russia, Ukraine, Moldova, Kazakhstan, Lithuania, Latvia, Estonia, Poland, Germany, Sweden, Netherlands, Great Britain, Denmark and Finland.

Following the disintegration of the USSR, Belarus faced a very difficult energy situation. Lacking energy resources of its own, Belarus was forced to import them from Russia at essentially world prices. This high cost of energy virtually strangled the republic's economy, as the annual cost of its energy imports was very close to the Belarus' national income. As a result, the Belarus debt from energy purchases is about US \$1 billion with little prospect of it being paid off.

At the same time, the power consumption per unit of production is roughly two to three times that of Western European countries. With this situation, Belarus is clearly faced with the need to develop a new energy policy which is oriented toward energy saving technologies for both production and consumption. Further, Belarus is typical of other Eastern European countries. Given this background, the focus of the workshop was first on clearly defining the problem and then hearing possible solutions from experts, primarily from the west.

Speakers included the Vice Premier of the Belarus Cabinet of Ministers, V. Kokorev; the Belarus Minister for Fuel and Power Engineering, V. Gerasimov, as well as a number of deputy ministers or their representatives. Speakers from the west include IAEE past president, Ulf Hansen of Rostock University, Kurt Lekas of Stockholm Energy, M. Weisheimer of the Institute fur Wirtschaftsforschung Halle and F. van Oostvoorn of the Netherlands Energy Research

(continued on page 20)

The Changing World Petroleum Market **Order Form**

The Changing World Petroleum Market, special issue of *The Energy Journal*, includes sections on Petroleum Demand and Supply, Refining, Natural Gas, Industry Structure and Evolving Markets, Changing Financial Requirements and Resources, and Policy Issues. Edited by Helmut Frank; 380 pages. U.S. and Canada, \$65; other countries, \$75, including mailing and handling. Use the form below to order, and mail together with your check to:

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Analysis of OPEC/Non-OPEC Cooperation

By William R. Edwards*

The petroleum producers of the world are understandably distressed with their inability to reverse the continuing underlying trend of lower and lower crude prices. There has been much said and written about the causes of the low prices and the action needed to correct the situation. Most commentators agree that if OPEC and non-OPEC producers could agree on a joint production control agreement the problem would be solved. Some officials, such as the Oil Minister of Oman, have actively lobbied OPEC and non-OPEC participants in an effort to get agreement on cooperative measures to rectify the situation. All participants and commentators seem to be in agreement that the problem is overproduction and the solution is a cooperative production cut.

While the imposition of a restriction on crude supply would indeed provide temporary alleviation of the price problems, this relief would be of very short duration (several weeks to a few months) because it does not address the problem in a fundamentally sound fashion. Thus it behooves the industry leaders to look more realistically at the results of an orchestrated supply restraint and alter their strategy to produce a more lasting and desirable result.

To better understand the reasons why conventional wisdom does not apply in the case of an OPEC/non-OPEC production cut, let us think through the expected sequence of events beginning with a coordinated agreement by OPEC and non-OPEC producers to restrain production. For our thinking purposes, let us assume that the agreement is for each group to reduce production by 5 percent, or a total worldwide reduction of 1.5 to 2 million barrels per day of crude oil. This would result in crude supplies being short of meeting demand by more than 1 million barrels per day.

Sufficient crude inventories exist worldwide to compensate for a million barrel per day drawdown for some months. On a superficial basis, then, there would be little impact from a 5 percent cut by half of the world's producers. In actual practice, however, the impact would not be so mild. Because the world's petroleum system is not one homogenous mix of completely flexible entities, dislocations and problems would appear almost immediately to some operators, resulting in some panic driven actions.

Panic is contagious! Shortly after the curtailment had begun, prices would respond and the response would not be gradual and orderly. Because of the enhanced volatility contributed by the futures markets, the price response would be exaggerated. This exaggerated price response would further feed the panic. Before long, commentaries on the reasons for the price move would convince the industry that there was, in fact, a significant shortage of production. This belief would be widely adopted, further feeding the panic and causing further upward price moves.

The prevailing attitude would shift from one of supply complacency to one of supply concern, and the industry would begin increasing inventories out of fear of being caught short. This action would create an added apparent demand on the system, exacerbating the contrived shortage of supply. The price increase hoped for by the OPEC and non-OPEC

producers would exceed their fondest wish in a relatively short time.

But the story does not stop there. The industry at that point would not be a stable, smoothly functioning industry responsibly supplying the needs of its consumers. Instead the industry would be involved in an erratic, panic inspired operation and would be participating in an action that had produced great uncertainty in both supply availability and price. This is certainly not the image the industry wants to display.

However, while significant, the image problem is not the only concern. Let us continue thinking through the dynamics of the petroleum supply system. One of the fundamental laws of economics, of physics, or of nature is that supply and demand ultimately must be in balance. Inventory swings can adjust for differences in supply and demand temporarily, but in the long run the two elements must be equal. *There is no such thing as a permanent shortage.* If one element of supply or demand changes, then the other will follow accordingly.

So what of the abrupt change in supply resulting from a 5 percent cutback? Will worldwide demand drop a corresponding amount instantly? The acknowledged impact of higher prices on demand suggests that if prices rise high enough, demand will decrease accordingly. Assuming this to be the case, what happens after the system has adjusted to the new supply level? Since ultimately the system will come back into balance, prices will again plummet, and we're back where we started, only at lower demand and production levels, hence lower total revenue levels. The curtailment provided a positive result which was only temporary; however it produced a negative result which was permanent, a loss of confidence by the consumer in the role of the producer as a responsible, dependable supplier. Is this the desired result? I think not!

Historical data indicate that even the results described above are only a portion of the negative aspects of an orchestrated restriction in crude supplies. There is more bad news to come. The crude price increase required to create an immediate 5 percent reduction in demand is very large, probably \$20 to \$30 per barrel. An increase in crude price of this magnitude cannot occur without causing dramatic changes in the thoughts and actions of the producers long before such an increase reaches its peak. In fact, the documented certainty is that some producers will abandon their resolve and breach the agreement long before such an increase can develop. Let us think through how and why this will happen.

In analyzing the process whereby some producers ultimately abandon production restraint agreements, it is helpful to select some arbitrary prices to work with in our thinking process. Let us suppose the price of a given crude is \$14 per barrel prior to the beginning of production restraint, and the desired price target is \$18 per barrel. The market price will move upward at a fairly rapid pace as lifters' desired nominations for crude are denied. At some point customers whose requirements are not being filled will begin to offer prices above the \$18 target. As the offered prices climb higher above the target price, it becomes much more difficult for an individual producer to continue to say "no" to attractive offers of \$20 to 25 per barrel. After all, the producer will rationalize, the agreement on production restraint has done its job and it won't hurt to cash in on the opportunity for a little

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more revenue from an increased production level. Since all producers are inclined to respond in a like manner, it won't be long before the market is again satisfied and prices will plummet to preagreement levels or lower.

The case described above is not merely speculative. It is based on historical fact. The description of events merely chronicles OPEC's past actions when production restraint has been effectively applied for short periods during the last decade. The positive results have consistently been of limited duration.

Let us consider a best case alternative, the highly optimistic case in which, for whatever reason, OPEC and non-OPEC producers maintain their production restraint and magically achieve the target price level or a level only slightly higher than the target. At this level there should be almost no impact on demand, hence the shortfall in supply precipitated by the 5 percent production restraint will cause inventories to eventually reach tank bottoms. At this point someone must increase production to fill the gap. Who will decide who gets the production increase? Who will decide how much additional production each producer is allowed? Will OPEC merely fill the gap in supplies created by the 5 percent reduction implemented by non-OPEC? Would non-OPEC producers feel cheated if the ultimate result of a million barrel voluntary cut in their output merely becomes a corresponding million barrel increase by OPEC countries? Unless these questions are satisfactorily resolved prior to an agreement on production restraint, the agreement will disintegrate.

The main point being made here is that the entire process must be thought through - not just the first step. If a thorough analysis of the entire process does not result in a convincing answer to the potential problems, then an alternative strategy, other than production cuts, must be adopted.

While the description of expected events resulting from the implementation of production restraint portrays a bleak outlook, this should not imply that there is *no* means for achieving an attractive, stable price. In fact, if an enlightened application of fundamentally sound pricing principles is applied along with a practical, working knowledge of commercial marketing practices, then an attractive, stable price can result. The real challenge facing the producers is to acquire the assistance of a person or a group who can provide and apply the necessary pricing and marketing competence.

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*** CALL FOR PAPERS ***

Deadline for Submission of Abstracts: August 1, 1996

Anyone interested in organizing a session should propose topics, objectives and possible speakers. Abstracts should be between 200-500 words giving an overview of the topic to be covered at the conference. At least one author from an accepted paper must pay the registration fees and attend the conference to present the paper. All Abstracts/Proposed Sessions and Inquiries should be submitted to:

Dr. Leena Srivastava
Dean, Policy Analysis Division
Tata Energy Research Institute
Habitat Place
Lodi Road, New Delhi - 110 003
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Phone: 91-11-4622246 or 4601550
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The 20th IAEE International Conference is being hosted by the Indian Association for Energy and Environmental Economics (IAEEE) and the Tata Energy Research Institute (TERI).

General Conference Chairman:
Dr. R.K. Pachauri

Technical Committee Chairperson:
Dr. Leena Srivastava

The Changing Politics of International Energy Investment

*Report on the RIIA/BIEE/IAEE London Conference
4 & 5 December*

The annual energy conference organized by the Royal Institute of International Affairs in association with the British Institute of Energy Economics and the International Association for Energy Economics differed in several respects from earlier conferences. The emphasis was on provision of the finance needed for worldwide investment rather than the issues of energy policy and economics which provided the themes of earlier conferences. Montreux Energy, a private forum set up in 1990 to examine capital needs and investment issues in the international energy industry, was associated with the organization of the conference. Sponsorship was given by the Global Environmental Facility – an indication of the importance it attaches to the encouragement of environment friendly investment in the energy sector and to its relationships with the private sector. Thanks are also due to ABN AMRO Bank for sponsoring the conference dinner.

The first day of the conference examined some of the main issues around international energy investment. On the second day, the conference broke into parallel sessions – another innovation – to examine some of the problems of transboundary finance in specific regions and projects.

The Driving Forces

The basic message in the opening speeches by George Mallinckrodt, President of Schroders PLC, who gave the keynote speech; David Simon, chairman of British Petroleum; and Jose Goldemberg, former Secretary of State for Science and Technology in Brazil, was that energy investment was a dynamic and rapidly changing activity. Energy demand was likely to grow rapidly in the developing countries – demand which could only be met by huge investment estimated by Mallinckrodt at \$50-100 billion a year for the power and petroleum sectors and by Goldemberg, at \$745 billion (1989 \$) in the 1990s for the power sector alone. The question was how the capital needed for this investment could be provided and what sort of investments would be made. The three speakers were agreed that the old model under which much energy investment in developing countries was financed by governments was no longer viable. Privatization of the energy sector was going forward in much of the world and globalization of the energy market was spreading from the oil industry to electricity and gas.

There were, of course, also differences of emphasis reflecting the background of the speakers.

Mallinckrodt emphasized the importance of increasing use of project finance and of developing local capital markets but also the need for increased saving in the OECD countries where the savings ratio had fallen from 35 percent a quarter of a century ago to about 20 percent now while in the developing countries it had risen to nearly 35 percent. (In volume terms, however, the total savings in France alone is greater than that for South East Asia.) OECD governments need to provide greater incentives for the individual to save, to reduce their social security commitments and to reduce significantly their deficit financing which is crowding out the

private sector.

Simon suggested that the international oil industry was moving into a new phase in which new areas of production such as Azerbaijan, Cambodia and Vietnam would be increasingly important. There would be many countries and projects competing for investment. The oil industry would, as in the past, be ready to accept risks but it would need to face new types of risk arising from the fact that many countries were only just moving to market economies. The industry would be likely to stipulate certain conditions before undertaking investment – the existence of appropriate legislation which could be implemented, the prospect of early oil and the involvement of multilateral lending agencies which could encourage policy changes which would provide a favorable environment for private enterprise. Without continuing liberalization, investment in new energy projects was unlikely to be forthcoming.

Goldemberg reminded the conference that governments had responsibilities for security of energy supply, for protection of the environment at local, regional and global levels and towards the disadvantaged sectors of society. Without public investment in the years after the Second World War, many developing countries would be without electricity and other energy inputs. However political interference, widespread corruption and a tendency in some countries for the energy companies to become states within the state had made the public sector utility model unviable. Governments would, in the future, be increasingly restricted to a regulatory role. What and how to regulate was the present challenge. A delicate balance would have to be struck between overregulation which would bring about a lack of interest in new investment and abandonment of social and environmental concerns which could result in a backlash towards excessive state involvement.

Providing the Finance

The conference approached the problem of providing the finance needed for energy investment from three angles: what investors require, how investments could be protected and how energy investment could be put on a sustainable basis.

What Investors Require

In the session on what investors require, Terence Cryan from Paine Webber Inc. and Otto Steinmetz from Deutsche Bank AG provided the somewhat different perspectives of a merchant and a global bank. Both speakers brought out the growing importance of project finance although Steinmetz stressed that it was not a substitute for equity – the two were complimentary. Cryan distinguished two categories of equity investors in energy projects – sponsors who were buying business and financial investors who were buying a stream of cash flows. Sponsors had a mandate to fulfill and a disposition to put their people to work. They therefore accepted relatively low rates of return. Financial investors looked for higher rates of return but they increasingly took a broader view of the prospects of a project. The growth of capital market financing in the last two years had altered the landscape for funding. Financial investors were increasingly willing to accept political risk in the belief that the need for continuing access to capital markets would inhibit governments from actions prejudicial to major projects. Equity in

the 1990s would not be confined to shorter term projects and the surplus of capital would force down returns. Steinmetz put more emphasis on risks. Banks attached great importance to the standing of sponsors. They would seek to mitigate completion risks by external cover, market risks by long term take or pay contracts, political and environmental risks by involvement of the multilateral lending agencies and financial risks by careful analysis of the economics of a project and their sensitivity to changes, by guarantees against exchange rate fluctuations and by the hedging of risks. Technological risks were however notably absent from his presentation.

David Herbert of ING Baring looked at privatization as a means of raising funds for investment. Since 1993, about \$12 billion had been raised from privatization in the energy sector (mainly of oil companies) in the emerging markets. Planned emerging market privatizations in the energy sector (excluding petrochemicals) might total \$60 billion over the rest of the decade. Strategic investors might provide over half these funds. International institutional investors would be looked to for the balance. They would be concerned with the track record and prospects of the company being privatized, its size, whether it has a focused strategy, the professionalism of its management, the existence of globally competitive assets and/or location advantages, a benign regulatory environment and a commitment to creating and sustaining shareholder value. Few privatizations had met all these criteria. The launching of YPF in Argentina in 1993 was an exception. At the other end of the spectrum, international investors are currently wary of Russian stocks because of the absence of a clear legal and regulatory framework for energy company operations, uncertainties about the future policies and actions of the government and fears that management will ignore the interests of passive minority shareholders. There are however signs that Russia is accommodating to the requirements of international investors and that prospects are much brighter. In general, future winners in the race for international investment funds are likely to be those best attuned to market criteria. Governments trying to privatize without yielding control or permitting rationalization would run an increased risk of being unsuccessful.

Another aspect of the situation in Russia was discussed by Peter Hobson of the International Institute for Energy Conservation speaking for the European Bank for Reconstruction and Development. In the former Soviet Union, according to U.S. analysis, energy savings of 20 to 25 percent of current use were possible in the short term with pay back periods of two years or less. In the longer term, savings of 40 percent were possible with pay back periods of three years or less. These were much better and quicker returns than on supply side investment. They presented a great opportunity for international investors but the response had been disappointing. There were a number of obstacles to demand side investment – the fact that the savings to finance loans were generated among a large number of consumers; the transaction costs involved in arranging investment in small tranches; shortage of skills and expertise; and the lack of laws and regulations to encourage energy saving. There had been some exciting initiatives such as the development of energy service companies. The EBRD was seeking to encourage such initiatives. In general, however, western investors needed to take risks to try and unlock the enormous commercial potential of energy saving investment in the former

Soviet Union. Energy efficiency should be given a higher priority in the drafting of energy laws and regulations. Key players in the reform process must recognize the need for sustainable growth and to avoid too much emphasis on the expansion of energy supply. Interestingly in a later session, many of these points were made in similar terms and on the basis of practical commercial experience by Catharina Nystedt-Ringborg of ABB (Asea Brown Boveri).

Protection of Investments

Two speakers covered the role of intergovernmental organizations in providing protection for foreign investors. Andres Hernandorena of the International Finance Corporation discussed the role of the multilateral lending agencies in the changing world financial market. The IFC had been founded in 1956 as part of the World Bank group to promote private sector investment in the developing countries. Its involvement in highly political infrastructure projects provided a measure of additional comfort both to foreign investors and to host governments. The IFC could also help to ensure that power projects met acceptable environmental standards by requiring that projects it supported complied with World Bank standards and local legislation. These were continuing roles but with the growth of world capital markets the IFC was increasingly involved in the mobilization of capital – even a small IFC participation gave significant protection against arbitrary government action – and the provision of advice. The IFC was now looking at the problem of investment in small scale projects such as renewable energies. Clive Jones, Secretary General to the Energy Charter Conference described the development and role of the Energy Charter, a development subsequently set in its political context in the dinner speech of Dr. Ruud Lubbers, former Prime Minister of the Netherlands and “founding father” of the Charter. The Charter itself, signed in December 1994, was a political declaration. The Charter Treaty, signed in December 1995, was a legally binding Treaty with provision for binding international arbitration on disputes. It was a multilateral investment protection agreement which went beyond anything yet agreed for other sectors. The basic concept was that of national treatment under which participating governments were required to treat investors from other charter signatories at least as well as their own nationals. Negotiations were now under way to extend national treatment to the right to invest. All signatories to the Treaty were to be treated for trade in the energy sector as if they were members of the GATT. Negotiations were under way to incorporate other results of the Uruguay Round, notably extension to services and service companies. Rights of transit were provided across the territories of signatory countries. The Treaty had now been signed by all the countries of Western and Eastern Europe (except Serbia-Montenegro) and the former Soviet Union, Australia, New Zealand and Japan. Canada was likely to sign soon. The United States had not signed which could only be to the disadvantage of U.S. companies. Ratification, particularly by Russia, was vital but the signs were good. There was, however, a need to fund an information program about the Charter. In the words of Ruud Lubbers, the Charter Treaty is important not just to promote reform in the former Soviet Union but as an example of how

(continued on page 12)

RIIA/BIEE/IAEE Conference (continued from page 11)

to secure improvements in the international economic system.

The other speakers in this session dealt with insurance against political and environmental risks respectively – Daniel Riordan of the U.S. Overseas Private Investment Corporation from the point of view of a government insurer and Richard Turrin of AIG Risk Management from that of a private sector insurer. Riordan explained in some detail the operations of OPIC which had been established as a U.S. government agency 25 years ago to assist U.S. citizens and companies. It provided insurance against political risk, project finance, investment funds and services to U.S. investors with funds to invest overseas. It was not involved in military projects or in certain “non-virtuous” projects such as tobacco, alcohol and casinos. OPIC has provided \$3.1 billion of assistance to power projects since 1990. However, perhaps the main value of OPIC to U.S. investors was that U.S. diplomatic muscle was likely to be brought to bear in a dispute with the host government. Turrin, in an interesting technical presentation, showed how insurance, combined with other financial mechanisms, could offer companies a lower cost means of reducing their environmental liabilities than purely physical programs, although good physical programs were needed to keep provisions low. However, it would always be difficult to insure against liabilities from long past events. A significant but unknown portion of liabilities from existing sites and past operations was inevitable whereas insurance was designed to deal with events which were not inevitable but not impossible. Innovations in the United States to develop various insurance and financing instruments were likely to spread in the world insurance and financial markets. However, as was pointed out in discussion, it remains to be seen how effective insurance will be in dealing with qualitatively new kinds of risk – an area where its record was, not surprisingly, poor.

Investment and Sustainable Growth

The final session of the first day dealt with the financing of energy investment in ways consistent with the wider objectives of society and government. Richard Emerton of Arthur Andersen started from the point that over the last half century, the oil industry by its massive contributions to hard currency earnings and government revenues and by the provision of employment had helped governments in the oil producing countries to resolve conflicts between their economic, social and political objectives. A series of changes in the oil world – the shift from central planning to market economics, fierce competition, rapid technological changes, environmental pressures and lowish oil prices – had now made it impossible for governments to use the oil industry to balance their main objectives. Governments either chose or were forced to privatize. This required a clear process:

Master Plan > Industry Restructuring > Corporatization >
Commercialization > Privatization

Commercialization was the key. Companies must be free to think about economics rather than volumes and people. Privatization would only succeed if governments

concentrated on the commercial objective, relinquished control and allowed restructuring.

The other three speakers dealt more directly with the promotion of investment which advanced environmental objectives. Mohamed El-Ashry, Chairman of the Global Environmental Facility described the efforts of the GEF with limited funds – a few hundred million dollars a year – to influence energy investment in developing countries running at about \$100 billion a year by joining its resources and skills with the World Bank, UNDP and UNEP and by using relatively small grants to leverage wider flows of investment in ways consistent with environmental and particularly climate change objectives. With the completion of its three-year Pilot Phase and the negotiations on governance restructuring, the GEF had a \$2 billion replenishment and was now moving into its full operational phase in support of the global environmental conventions. The GEF Council set out in October 1995 an operational strategy for assisting eligible countries towards meeting the objectives of the Framework Convention on Climate Change and its sister Convention on Biological Diversity.

The GEF had adopted novel arrangements for translating the program priorities of the two Conventions into action – a double majority voting system on the Executive Council under which the 18 recipient countries and 14 donor nations represented shared responsibility for decisions and the admission of nongovernmental organizations as observers to Council meetings. GEF placed emphasis on building indigenous capacity (including people) for climate change management and on long term policies to remove barriers to energy conservation, to promote renewable energies and to reduce the long term costs of lower greenhouse gas emission technologies. It was developing methods of cooperation with the private sector. El-Ashry was able to quote some successful projects but perhaps inevitably they appeared small in relation to the scale of the problem.

Two private sector speakers completed the session. William Schmidt of Advent International plc described a number of sources of funds for environmentally benign investment – charitable bodies particularly the MacArthur and Rockefeller Foundations, ethical investment funds, various investment funds raised with government help or under government pressure such as the Envirotech Investment Fund raised by U.S. utilities and independent venture capital funds like Advent. Again the impression was of useful but small scale work in face of the sometimes high costs and risks of the new technologies compared with conventional alternatives and the long time scale for their introduction. Catharina Nystedt-Ringborg spoke of the problems of promoting energy efficiency in Russia – referred to above. More generally she argued that the world was rolling in capital but much of it was short term and volatile – a dangerous mix as shown by the Mexican debt crisis. There was too little long term capital corresponding to real development needs. The question was whether rapidly rising energy demand in the developing countries resulting from rising population and changes in lifestyle would be met in the same way as it had been in the old world or by adaptation to reduce the environmental impact. The latter course might well require substantial government funding to private sector investment.

Transboundary Finance – Regions and Projects

Regions

Parallel sessions examined problems and prospects in the dynamic growth and the exporter regions. The speakers on the dynamic growth regions focused on southern and eastern Asia. For all of them the central questions, both political and economic, surrounded China. Jean-Pierre Lehmann of the European Institute of Japanese Studies in Stockholm emphasized that the awakening of China was taking the world into uncharted territory. A transfer of political and economic power from Japan to China was in prospect comparable to the transfer from the United Kingdom to the United States earlier in the century. Indeed it was likely to be more fundamental. Japan had integrated into the world system largely on western terms, protecting its national interest. China saw itself as a civilization and would integrate on its own terms. Moreover, it was not just a nation with a capital in Beijing but an economy operating through Chinese populations abroad. At the same time, China faced sharp internal tensions with massive unemployment and the booming maritime areas increasingly disparate from the rest of the country. The relationship with Japan was fragile and there was the potential for major disputes with the west over Hong Kong and Taiwan. Nevertheless, the prospect of the reawakening of China should be seen as a very exciting one for the west. Keun-Wooh Paik of Aberdeen University Petroleum and Economic Consultants highlighted China's move from oil exporter to rapidly growing importer. This was raising concerns about energy security in the whole region. The region had a major interest in developing the Russian gas resources in the Sakhalin, Yakutsk and Irkutsk regions. Given their huge scale, such projects could only proceed on the basis of multilateral cooperation with a wide range of investors and with gas supplied to several countries. Development of a regional pipeline grid would be needed to realize the full benefits of the projects. As a first step Paik called for the development of a regional energy forum to bring interested parties together and devise ways forward. In contrast Fereidun Fesharaki of the East-West Center in Hawaii was skeptical about Asian pipeline projects. They were not economic and therefore would not happen. There was also a lack of incentive to develop the hydrocarbon resources of the Russian Far East as Moscow would take any profits of development. Global warming was seen as the rich man's problem and would play little role in the development of the Asian energy sector outside Japan. East Asian dependence on Middle East oil was likely to rise and coal would continue as a major energy source.

Three of the speakers in the session on exporting regions dealt with the interlinked problems of the Middle East, Russia and Central Asia. Rosemary Hollis of the Royal Institute of International Affairs noted that the Middle East attracted a paltry 3 percent of total direct foreign investment in 1993. There were intrinsic problems – lack of skilled labor, dominance of the public sector, inefficient and corrupt bureaucracies and insufficient protection for foreign investors – but also political problems. However these problems were not peculiar to the Middle East. The region was made special by the social problems of providing education and jobs for fast growing populations when it was difficult to increase oil income, by the absence of political mechanisms for the expression of popular discontent within the existing systems

and by interstate problems among which Kuwait stood out. Three states were under varying degrees of embargo. That on Libya at its present level was not a serious problem and European states were unlikely to agree to an oil embargo. The embargo on Iraq was likely to hold despite the anxiety of France and Russia to recoup debt.

In the long term, with or without Saddam Hussein, economic prospects in Iraq should be good. The U.S. embargo on Iran was unilateral and the cause of serious differences with the EU. In practice it had created a negative mood for third country investors. U.S. policy on the embargoes was driven partly by domestic politics but it also worked to the interest of U.S. allies in the region, particularly Saudi Arabia. It created a situation in which U.S. companies were in a strong position to compete for military and other business in Saudi Arabia while European countries were circumscribed in their ability to compete in Saudi Arabia and to exploit alternative opportunities in Iran or Iraq.

Fred Halliday of the London School of Economics argued that some of the worst fears at the time of the break-up of the Soviet Union had not been realized. The nuclear proliferation issue had been resolved. Although the frontiers of the newly independent states were arbitrary they were not a major issue for the moment. There were no strong Islamic movements except in Tadjikistan. Russia had accepted the independence of the new states and the problems of the Russian population in them were being resolved by emigration. Russia was, however, determined to maintain its economic influence as was shown by its stand on the hydrocarbon resources of the Caspian. The Central Asian republics were ruled by ex-Communist elites which were sometimes inefficient and corrupt and which maintained authoritarian regimes. Oppositions were likely to emerge in due course but they had not done so yet.

A bleaker picture of the situation in Russia was drawn by Michael Sturmer of the Research Institute for International Affairs in Germany. The political and economic situation inside the country was unclear but there was a long road still to travel to the establishment of a state of law and an effective infrastructure. The recycling in the west of large amounts of Russian dollars was corrupting Western societies. There were a number of contentious issues between Russia and the west and there had so far been no major western investment in Russia outside the energy sector. The primary western interests were in cooperation in such areas as Bosnia, the fight against terrorism and potentially the containment of China and in Russia becoming a "status quo" country where civil society had a chance. This might imply some partial restrictions on democracy.

An interesting example of the way in which political reform could clear the way for possible economic cooperation was discussed in the fourth paper by Thulani Gcabashe of the South African electricity company Eskom. Gcabashe described ideas for the eventual development of an African electricity grid. The first step would be the establishment of a loose power pool based on cooperation in planning and cost minimization. Agreements which would provide a framework for conduct between members were due to be signed by a number of utilities on 8 December. The grid would be made up incrementally by smaller projects, starting with the

(continued on page 18)

IAEE International Conferences

The next three IAEE International Conferences will be held in Hungary in 1996, India in 1997 and Canada in 1998. Council has received proposals to have future IAEE International Conferences in Germany in 1999, Korea in 2000 and Russia in 2001, though there has been no Council decision relative to these years. The Council encourages the local affiliates to continue their work in planning future conferences and to submit proposals to the Vice President for Conferences.

Planning for the 19th IAEE International Conference in Budapest, Hungary, 27th-30th May 1996, is well under way under the capable management of General Conference Chair, Tamas Jaszay (Fax 36-1-463-3273). The program has been worked out by the program committee and the first draft has been sent to members. The general conference theme is: *Global Energy Transitions*. This is the first time in the organization's history that we have arranged an international conference in Eastern Europe. This gives us a unique opportunity to meet in Budapest and discuss topics of mutual interest. In addition to a very interesting program and a very impressive list of speakers, the beautiful city of Budapest will add to the general flavor of a successful conference. The Hungarian organization has, however, a challenge to raise sponsor funding for the meeting. Members are encouraged to support Tamas Jaszay and contact him directly regarding sponsor funding!

Assuming satisfactory budget details can be worked out, the 20th IAEE International Conference will be 22nd to 24th January 1997, in New Delhi, India. The conference theme is: *Energy and Economic Growth: Is Sustainable Growth Possible?* The General Conference Chair is Dr. R.K. Pachauri (Fax 91-11-462-1770). The conference will be hosted jointly, by the Indian Association for Energy and Environmental Economics (IAEEE) and the Tata Energy Research Institute (TERI). At TERI, both Dr. Pachauri and Dr. Leena Srivastava are instrumental in the organization of the conference. TERI has a very good research staff and the infrastructure to make our 1997 conference a great success. Any support and ideas, and specifically sponsor funding, are welcome and can be forwarded directly to Dr. Pachauri.

The 21st IAEE International Conference will be 13th-16th May 1998, in Quebec City, Canada. The theme will deal with the broad energy issues in the policy environment which will be relevant at the time. Canada is both a large consumer and producer of energy. All major energy sources are traded with their southern neighbor, the U.S.A. It is a natural place to debate energy issues in an international context. The general conference chairman is Jean-Thomas Bernard (Fax 418-656-7412) and the program chair is Andre Plourde (Fax 613-562-5999). Quebec City offers a unique European experience in North America.

In addition to the Council's decisions regarding the 19th, 20th and 21st IAEE International Conferences, it has received a proposal to host the 22nd IAEE International Conference in 1999, in Berlin, Germany, at the occasion of the 10th anniversary of the fall of the iron curtain. This proposal has been submitted by Professor Georg Erdmann (Fax 49-30-314-21779/23222) on behalf of the German IAEE affiliate. Further, Council has received a proposal from Dr. Jeong-Shik Shin (Fax 82-343-238984/224958) on behalf of

the Korea Resource Economics Association to host the 23rd IAEE International Conference in Seoul in 2000. The Council has also received a proposal from Vassily R. Okorokov (Fax 812-5356720/5526086), Tatiana Lisochkina (Fax 7-812-552-6086), and Anatoly Dmitrievsky (Fax 7-095-1358876/2003937) to arrange an IAEE International conference in St. Petersburg, Russia in 1999 or 2000. Council is very pleased by these active proposals and encourages these affiliates to continue their efforts for future conferences. Council has, however, not made any formal decision regarding these conferences.

The Council will discuss future IAEE International Conferences beyond 1998 at its next Council meeting in Budapest, 27th May 1996. Any affiliate interested in organizing a future conference is welcome to submit its proposal to the Vice President for Conferences before 15th April 1996.

The IAEE is collaborating on a forthcoming International Conference on *Energy, Economy and Environment*, June 25th-27th, Osaka, Japan, organized by the Japanese Society of Energy and Resources (JSER) and the International Institute for Applied Systems Analysis (IIASA). For further information please contact Professor Yutaka Suzuki (Fax: 81-6-879-7832).

The IAEE is further collaborating on a Regional IAEE Conference on *Transport, Energy and Environment*, 3rd-4th October 1996, Marienlyst, Elsinore, Denmark. Deadline for submission of abstracts is 15th April 1996. For further information please contact Dr. Hans Larsen (Fax: 45-4675-7101).

The IAEE collaborated on an East-European Workshop, 4th October 1995 in Minsk, Belarus, during the Belarusenergia International Congress 3rd-6th October. Both Professor Padalko and Professor Ulf Hansen were instrumental in the success of this very interesting workshop.

The annual International Conference convened on 4th-5th December 1995, in London by the Royal Institute of International Affairs in association with the British Institute of Energy Economics, Montreux Energy and IAEE was very successful. The general conference theme was *The Changing Politics of International Energy Investment*.

In addition to these conferences, we also enjoyed a very interesting Regional Conference in Rome, in April 1995, organized by our Italian affiliate and an extremely well organized and interesting IAEE International Conference, 4th-7th July 1995 in Washington, DC.

All of these events and plans for future conferences show a very high level of conference activity within the IAEE organization. We encourage affiliates to continue their active work for future conferences. The general Principles for IAEE International Conferences and the Principles for IAEE Joint Meetings, Seminars and Conferences can be obtained by contacting the Vice President for Conferences or Executive Director David Williams at IAEE Headquarters. The IAEE Headquarters will provide management and consulting support to the IAEE conferences. It is an IAEE policy to actively involve IAEE Headquarters in the organization of the Annual International Conference.

Arild N. Nystad
Vice President for Conferences

!!! Mark Your Calendar - Plan To Attend !!!

Energy Policy Formulation in the New Political Environment

United States Association for Energy Economics / National Capital Area Chapter, USAEE
In cooperation with the School of Advanced International Studies

March 11, 1996
Kenney Auditorium, Paul H. Nitze Building, Johns Hopkins University

Overview

If you're concerned about the new direction of energy policy in the U.S., this is one seminar you certainly don't want to miss. The Washington Energy Policy Seminar will examine how energy policy is being shaped within the new political environment, the changing direction of energy policy, where its effect will be felt and how it dovetails with other national and regional interests. The fast paced but authoritative sessions in this full day seminar will give you a better sense of where energy policy in Washington is headed.

Program

A top flight program is being assembled. A series of three-person panels of high ranking government officials as well as private/public experts will focus crisply on the critical aspects of U.S. energy policy, leaving plenty of time for questions and answers. Below is an abbreviated version of the program, listing only the speakers who have confirmed participation.

8:00am	Registration and Continental Breakfast
9:00am	Welcome & Introductory Remarks, Joseph Dukert, Program Chairman
9:15am	Opening Address, Dan Reicher, Assistant Secretary for Policy, U.S. Department of Energy
9:45am	"The Energy Policy Process" - Linda Robertson, Assistant Secretary, Department of the Treasury - Vito Stagliano, Former Principal Deputy Assistant Secretary For Policy, U.S. DOE - Cathy Van Way, House Commerce Committee
11:00am	"Conceptual Perspectives on Energy Policy" - Llewellyn King, Publisher, <i>Energy Daily</i> - Randy Davis, Stuntz and Davis - Ken Malloy, Expert in Utilities Regulation
12:45pm	Keynote Address: Senator J. Bennett Johnston, Committee on Energy & Natural Resources
1:15pm	"Regional Interests and National Energy Policy" - Greg Renkes, Chief of Staff, Senate Energy Committee - Christine Hansen, Exec. Secty., Interstate Oil and Gas Compact Commission
2:15pm	"The Energy/Environment Tradeoff in Energy Policy" - Bill Nitze, Assistant Administrator, EPA - Paul Portney, President, Resources for the Future
3:30pm	"Linking Energy Policy & Foreign Policy" - Paul D. Wolfowitz, Former Undersecretary of Defense - Bill Martin, Former Deputy Secretary, U.S. DOE - Eric Melby, Former NSC Staff

Who Should Attend . . . And Why

There are many benefits from attending this one day seminar. Attendees will come away with a broad understanding of energy policy and the developments that will help shape the future of the industry. Moreover, challenges within the energy industry and milestones that lie ahead will be addressed. Attendees will also benefit by networking with key industry and governmental leaders. Below is a partial listing of who should attend:

- ◆ Energy Policy Analysts
- ◆ Managers of Energy Economics
- ◆ Governmental Employees in Energy/Resource Planning
- ◆ Energy Consultants
- ◆ Corporate Planning Economists
- ◆ Energy Risk and Derivatives Specialists
- ◆ Energy Forecasting Specialists
- ◆ Oil and Natural Gas Executives
- ◆ Academics Specializing in Energy Policy & Analysis
- ◆ Energy Rate Executives
- ◆ Electric and Utility Supervisors
- ◆ Energy Environmental Analysts

Registration

Registration fees are \$75.00 (includes registration materials, lunch and closing reception) for USAEE/NCAC members attending only the March 11th Seminar; \$95.00 for non-USAEE/NCAC members attending only the March 11th Seminar. A special rate of \$65.00 is extended to NABE members who are either a USAEE or NCAC member and attending both the NABE Policy Seminar and USAEE/NCAC Seminar; \$85.00 for non-USAEE/NCAC members attending both the NABE and USAEE/NCAC Seminars.

Registration Form

Energy Policy Formulation in the New Political Environment

March 11, 1996 - Kenney Auditorium, Paul H. Nitze Building, 1740 Massachusetts Avenue, NW, Washington, DC
Johns Hopkins School of Advanced International Studies

____ \$75.00 USAEE/NCAC Member (attending only USAEE/NCAC Seminar) ____ \$95.00 Non-USAEE/NCAC Member (Attending only USAEE/NCAC Seminar)
____ \$65.00 NABE Member attending both the NABE Policy Seminar & USAEE/NCAC Seminar and is a member of either the USAEE or NCAC
____ \$85.00 NABE Member attending both the NABE Policy Seminar & USAEE/NCAC Seminar who is not a member of either the USAEE or NCAC

Name: _____
Title: _____
Company: _____
Address: _____
City/State/Zip: _____
Phone: _____ Fax: _____ E-Mail: _____

Please return this form with check payable to "NCAC/IAEE" to: Bernard A. Gelb, Economics Division, Congressional Research Service, Washington, DC 20540-7430. If you have any technical questions regarding the Seminar contact either Bonn Macy of the NCAC at 202-328-3047 or David Williams of the USAEE at 216-464-2785.

Energy Transition in Eastern Europe and the CIS

Report on November Milan, Italy Conference

With *Energy in the Restructuring of the Former USSR and Eastern Europe* as its theme, this AIEE/IEFE seminar held at Bocconi University in Milan last November examined the changes in energy consumption and production that have occurred and are anticipated in the former FSU and Eastern Europe.

Perhaps the major conclusion was that the restructurings that have occurred have brought the area close to an upward turning point and that the prospects for 1996 energy production and consumption are improved, if not good.

In the case of oil, after six years of declining production, 1996 will probably see stabilization and exports may actually increase. Oil reserves in Russian and the CIS countries are increasing as a result of new discoveries and reappraisals, though development continues to be difficult due to the uncertain and unclear legal aspects of the countries. Further, pipeline system problems continue to constrain development and distribution.

Natural gas output in the region, which decreased over the last four years, is now forecast to rise and is expected to reach 700 billion cubic meters by the year 2000.

Electric power output in Russia and Eastern Europe, after falling about 30 percent, is expected to increase gradually in the near future to support increased industrial and domestic uses. A few new power plants will be built though financing will remain a constraint. Local governments will continue nuclear projects in Czech, Slovakia, Russia and Romania in order to ensure electricity availability and reduce imports. Most governments, being short of cash, have decided to privatize electric utilities, though a variety of schemes are being used to accomplish this. Natural gas is expected to be increasingly substituted for coal and oil in electricity production in order to reduce environmental problems in urban areas.

Industrial energy efficiency is of primary concern as most plants in Belarus, for example, operate at a level some 30 percent below western standards. This is often due to poor equipment maintenance and inefficient management. Nevertheless, with the help of western technology and cooperation and the European Energy Charter, the expectation was that efficiency could be raised.

Edgardo Curcio

Editor's Note (continued from page 1)

some of the potential results of OPEC/Non-OPEC cooperation and puts forth a cogent argument that such cooperation needs to be entered into very carefully and the longer term implications clearly thought out.

David Jones does his usual fine job of summarizing in detail the annual RIIA/BIEE/IAEE London Conference. After reading his accounting, one comes away with the feeling of having actually been at the meeting.

Bruno Fritsch looks at the relationship between ecological sustainable development and energy and concludes that only when population stabilization is reached can we ensure ecologically sustainable economic growth. Bjorn Saga of the IEA presents a concise summary of the *IEA Gas Security Study* and concludes that IEA countries are generally well placed to withstand major gas supply disruptions.

We have two summaries of recent workshops/seminars on the Eastern European energy situation both of which draw some fairly optimistic conclusions. Still on the subject of Eastern European energy, Tamas Jaszay Jr. and Enkio Kiss discuss the privatization of the Hungarian Energy Industry. Michael Parker presents another of his very concise seminar reviews, this one on a BIEE seminar dealing with nuclear power.

Finally Mary Lindahl looks at the question, *Should Oil States Hedge Oil Revenues?*, and reports the answers gleaned from a University of Alaska seminar.

Again, we'd like to urge our readers to continue to favor us with articles for the Newsletter. Your contributions are most appreciated.

DLW

Directory to Include E-mail Addresses

The *1996 Membership Directory* will include e-mail addresses. Members are encouraged to add their e-mail address to their *Directory Update Form* when they receive it, or otherwise let Headquarters know of their address so it may be included in the *Directory*. All members are encouraged to visit our web site at <http://www.IAEE.org> and to leave messages for Headquarters at IAEE@IAEE.org.

Conference Proceedings 16th USAEE/IAEE North American Conference Dallas, Texas, November 6-9, 1994

The Proceedings from the 16th North American Conference of the USAEE/IAEE held in Dallas, TX, are now available from IAEE Headquarters. Entitled *The World Oil & Gas Industries in the 21st Century*, the proceedings are available to members for \$55.95 and to non-members for \$75.95 (includes postage). Payment must be made in U.S. dollars with checks drawn on U.S. banks. To order copies, please complete the form below and mail together with your check to:

Order Department, IAEE Headquarters, 28790 Chagrin Blvd., Suite 210 Cleveland, OH 44122, USA

Name _____

Address _____

City, State, Mail Code and Country _____

Please send me _____ copies @ \$55.95 each (member rate) \$75.95 each (nonmember rate).

Total enclosed \$ _____ Check must be in U.S. dollars and drawn on a U.S. bank, payable to IAEE.

Technology: Servant or Master? The Nuclear Conundrum

Notes from the Fourth BIEE Seminar on The Economics of Technical Change, 15 November

The discussion was opened by Adrian Ham of Nuclear Electric. The main points in his presentation were:

- New technology tended to prosper where there was significant incremental profit or advantage, the industry concerned was viable and the market was growing thereby reducing the impact of the new technology on existing assets.
- In the case of nuclear, much of the stimulus had come from developments external to the UK electricity industry – the Suez crisis, OPEC, and, more recently, global warming. If global warming did prove to be a major issue, then it was difficult to see how solutions could be devised without an expansion of nuclear power.
- The nuclear experience raised three related questions, namely,
 - Is profitability always the most legitimate driver of technical change?
 - Can “sustainability” (in a global environmental sense) be made to drive technical change, and if so how?
 - What kinds of industry structures were most likely to be able to address these issues?

The following points were made in the ensuing discussion:

- It needed to be recognized that the origins of nuclear power lay in military R&D. Even though in some sense, nuclear power was now an “established” technology, further R&D would be required to develop the super systems necessary for greater public acceptability. Such funding would not emerge from normal commercial activities.
- With plentiful supplies of fossil fuels and given the difficulties of nuclear power’s public acceptability, the political weight to put on the other side of the balance needed to be very great if nuclear power was to proceed. This would be unlikely until CO₂ reduction became a political imperative on an international as well as national basis.
- The present direction of policy, with its emphasis on competition and energy as a “commodity” was particularly inimical to nuclear power, which required stable frameworks and assured markets to justify the large capital expenditure involved. Nuclear power had tended to prosper only where there was vertical integration/monopoly and (effectively) government guarantees of last resort.

Michael J. Parker

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DANISH ASSOCIATION FOR ENERGY ECONOMICS

In cooperation with

THE INTERNATIONAL ASSOCIATION FOR ENERGY ECONOMICS

First Announcement, Call for Papers
for

A Regional European Conference in Celebration of the
10th Anniversary of the Danish Association on:

TRANSPORT, ENERGY AND ENVIRONMENT

The importance of the transport sector in relation to
energy demand and long term environmental goals.

To be held at Marienlyst, Elsinore, Denmark,
3-4 October 1996

The conference will focus on economic and broader
policy issues as well as technological perspectives. Further,
focus will be primarily on medium to long term aspects. The
conference is primarily devoted to European issues, but
papers addressing global aspects are also welcome. General
conference themes:

- Transport sector in relation to energy demand and long term environmental goals
- Recent trends in transport energy demand
- Lifestyle changes and demand for energy and transportation
- Actions and policies to reduce urban air pollution
- Incentives and cost effectiveness of public policies
- Scope for further energy intensity improvements
- The potential for fuel substitution; towards non CO₂ fuels
- Implications for energy industries, the business sector and international trade

The conference is supported by the International Association for Energy Economics (IAEE) and the European Foundation for Cooperation in Energy Economics (EFCEE).

Deadline for submission of abstracts is **15 April 1996**. Abstracts should be between 400 and 600 words giving an overview of the scope of the paper proposed. Authors will be notified whether their paper has been accepted for presentation by 1 June 1996. All abstracts and inquiries should be submitted to the chairman of the program committee as soon as possible and no later than 15 April 1996 at the address below:

Hans Larsen, Ph.D.
Head of Systems Analysis Department
Building 110, Riso National Laboratory
P.O. Box 49, DK-4000 Roskilde, Denmark
Phone: 45-46-77-5101
Fax: 45-46-75-7101
e-mail: hans.larsen@risoe.dk

connection of Angola, Malawi and Tanzania to neighboring countries. The capital needed to develop interconnection would not be easy to raise but there were prospects of some funding by the World Bank and the African Development Bank and the underlying basis for the project was there – a stable political environment in southern Africa, economic liberalization and growing trust between the countries involved.

Projects

Four sessions – three on conventional industries and the fourth on the “Sunrise” industries – examined the problems and experience of investment in specific industries and projects. These sessions provided an opportunity for the conference to see how many of the general points made on the first day were resolved, or in many cases not yet resolved, in practice. The main conclusions of the project sessions were subsequently reported to the final plenary session.

The session on power projects heard presentations from William Gathmann of ENRON, Herman Mulder of ABN Amro Bank, Paul Bennett of National Power and Martin Blaiklock of International Project Finance. The first three speakers were able to report considerable success from which they drew similar lessons. Gathmann identified the main factors in ENRON’s success as a strong and decentralized management team, a mix of businesses which gave the company a competitive advantage on complex deals, effective project risk management and a strong project financial capability. The best safeguards against political risk were a strong local partner, the presence of multilateral lenders in the project, appropriate contract terms and political risk insurance. To guard against foreign exchange risk, payment should be made in dollars or local currency convertible into dollars. Mulder, like Mallinckrodt and Goldemberg in the opening session, emphasized the scale of projected investment in the power sector – on his estimates \$1500 billion worldwide by 2003 of which \$400 billion might be in independent power projects in emerging countries. Privatization had been forced for practical reasons but the sector was still seen as strategic and sensitive to political forces. Foreign investors needed to be convinced of the fundamental strength of a project. Bipartisan political support was desirable and both local investors and multilateral lending agencies should be involved. Similar themes appeared in Bennett’s presentation of the Hub power project which had been successfully launched in Pakistan. Factors in the success were the quality of the security package, the support of the World Bank, quality contractors and the wholehearted support of the host government. On the other hand, Blaiklock argued that the only funds available for nuclear investment in Central and Eastern Europe and the former Soviet Union were through government agencies’ loans or grants. The risks were too great for other investors. Decisions were dominated by political considerations which had distorted decision making, distracting attention from possibly better options such as combined cycle gas turbine plant or energy savings programs. In his report to the final session, Michael Morrison of Caminus Energy pointed to the long timelags in putting deals together – eight years for the HUB project. Even if the timelag became shorter as more

models for projects emerged, it would be almost impossible to satisfy rising demand for electricity in the emerging countries. Investors naturally sought to reduce their exposure to political and exchange rate risks. Governments should concentrate on macro-economic management, privatization and restructuring of the utility sector and creation of a regulatory framework managed by an independent body.

The session on pipeline and transport projects covered disparate ground with three papers on pipeline projects and one paper on the trans-European networks. Bill Byrd of the Chase Manhattan Bank gave an account of the Algerian Sonatrach pipeline and of the way in which the problems of getting it under way had been overcome. Quincey Lumsden of the Gulf-South Asia Project of Trans Canada Pipelines and Shirin Akiner of the School of Oriental and African Studies discussed the problems around projects for pipelines from major oil and gas producing regions to large consuming areas – the Gulf to South Asia and the Caspian to European markets respectively. Both speakers brought out the importance of private investment in these projects but also the political, institutional and commercial obstacles which they faced. Lumsden was nevertheless optimistic about the prospects of the Gulf-South Asia project, Akiner from a more detached position was more cautious about the commercial viability of the various schemes for the transport of oil and gas from the Caspian.

In the final paper in this session, Ian Gowans of the European Commission described, in the context of the forthcoming Commission White Paper on European Union energy policy and the development of the internal energy market, current proposals to encourage the development of energy networks at European level. The Council of Ministers had adopted financial regulations for the support of such networks and was considering proposals for energy network guidelines and administrative and technical support. Commission support would take the form of aid for feasibility studies of projects of common interest. Such support would not be restricted to projects within the territory of the Union. Financing of a study of increased electricity capacity between Sweden, Finland and Poland was being considered. For gas the construction of a new pipeline system from the former USSR and the upgrading of the existing ones through Central and Eastern to Western and Southern Europe were a priority.

Reporting to the final session Paul Stevens of the University of Dundee identified some common themes:

- transport is a necessary evil to bring supplies and consumers together;
- politics inhibit both the building and the operation of lines;
- pipelines attract enormous economies of scale: once built, the majority of costs are sunk and provided variable costs are covered it pays the owner to pump;
- it follows that a transit country can squeeze out any profitability in the pipeline;
- pipelines and networks are natural monopolies which governments will almost inevitably regulate.

For these reasons, the immediate commercial prospects of the pipeline projects were bleak, but if the hydrocarbon potential of the central Asia republics and the enormous gas reserves of the Gulf were to be realized, major new pipeline

projects must in due course come to pass.

The session on production projects examined projects in four "frontier" areas. David Rossiter of CONOCO and Takanori Ogino of Mitsubishi spoke of the problems facing the foreign investor in two countries moving in different ways away from a command economy. They developed themes which had already been raised by a number of speakers – Simon and Herbert among others. Rossiter argued that in Russia the problems were political and bureaucratic rather than geological. Managerial problems were very much higher in a Russian venture than in most other parts of the world. There was a clear need for improved fiscal and regulatory regimes, particularly the passage of the stalled legislation on production sharing agreements. Russia today was a place for investors intrigued by challenges and willing to take risks in order to be positioned to take part in the potential Russian "economic miracle." There was however a need for investors to look beneath the surface and to take a long term view. Success for a foreign investor would be determined to a great extent by a willingness to become a Russian entity rather than a foreigner trying to impose a foreign way of doing business. Ogino saw similar problems and prospects in Vietnam – lack of infrastructure, inadequate legislation, lack of knowledge and experience of a market economy and inefficiency and cumbersome procedures in government offices. However, Vietnam offered good opportunities for foreign investors with money, technology, good ideas and some patience although political considerations would sometimes take precedence over economic rationality.

Hormoz Naficy of Hydrocarbons Venture Ltd discussed the different political problems of investing in Iran. Iran had very substantial resources of oil and gas but since 1981 exploitation had been hampered by a shortage of experienced oil industry personnel, damage during the Iran-Iraq war and the various embargoes to which the country had been subject. Iran was now seeking to end its isolation but the Iranian government was willing to consider foreign participation in offshore areas only. Foreign entities were required to enter into service type contracts. The Total agreement, concluded in 1995, suggested that there were possibilities of cooperation on this basis. The current state of Iran-U.S. relations remained a major obstacle but radical change in the political environment was always possible, usually when least expected. In the final paper, Peter Rugg of Triton illustrated, with the example of the Cusiana project in Colombia, the possibilities of creative financing based on forward oil sales for a project in a country which was reasonably stable. In his report to the plenary session, Peter Davies of BP pointed out that increased production of oil and gas would come not only from the OPEC countries but also from new producing areas. These were often technically difficult. There would be much competition between producing countries and only the best projects would go ahead. The initial issue, given a good technical project, would be the environment for investment in the host country and the risks to which the project was exposed rather than finance. Upstream investors in the oil industry would need the ability to forge a constructive partnership with the host government.

The optimistically if rather quaintly named session on "Sunrise" industries had two papers on renewable energies and two on efficiency in energy use. Both David Lindley of National Wind Power in the U.K. and V. Bakhthavatsalam of

the Indian Renewable Energy Development Agency recognized that the renewable energies currently needed government support to compete with the conventional energies although some of them were close to becoming competitive especially if external factors, particularly the protection of the environment, were taken into account. Government support had been given successfully in the U.K. indirectly through the non fossil fuel obligation and in India directly by grants and concessional credit provided by IREDA. The problem on end use efficiency was the different one of overcoming the market barriers which impeded economically effective investment.

David Freeman, former head of the Tennessee Valley Authority and the New York Power Authority, made a powerful plea for strong policies to promote investment in energy efficiency. Questions about the environment and the poor could not be brushed aside. They were at the heart of the political issues around energy investment. World economics would have to adjust to the environment. The question was whether this adjustment would be made harshly or with foresight. Greater energy efficiency was the only way of sustaining economic growth without creating an energy bottleneck. Financial institutions should be examining the opportunities to earn a better return by investing in energy efficiency. Freeman's presentation was complimented by Piyasvasti Amramand of the National Energy Policy Office in Thailand who gave a detailed account of the government's policies to promote efficient energy use. These brought together a restructuring of energy prices so that now they at least covered financial costs, demand side management programs by the electric utilities, the establishment of an energy conservation fund by the government and the promotion of small power projects. The problems in implementing these policies were not finance but rather a lack of skilled manpower and of basic infrastructure like testing facilities. In his report, Stewart Boyle of the International Institute for Energy Conservation reiterated that the small size of projects in the "Sunrise" industries made for a difficult market with high transaction costs. The development of energy service companies might be the solution. The financial community was, however, conservative about technologies like wind power. Innovative financing packages, based on partnership between the public and private sectors so as to take account of external factors, were needed.

Conclusions

In a short general discussion, attention was drawn to the distinctions between financial, political and social concerns; the opportunities for financial innovation and packaging; the risk that liberalization in the energy sector would make markets more unstable over the medium term; and the continuing need for government involvement but on a more rational basis. In conclusion, John Mitchell, Chairman of the Energy and Environmental Program at the Royal Institute of International Affairs summed up his personal impressions of the conference:

- There were two underlying political themes – government versus private sector and supply side versus demand side investment.

(continued on page 20)

RIIA/BIEE/IAEE Conference (continued from page 19)

- These themes could not be discussed in the same terms for developed and developing countries. In the developing countries the crucial issue was the securing of supply to meet expanding demand.
- There was no contradiction between investing to increase supply and investing to reduce demand. For the next decade or so at least, both would be needed.
- Capital markets were expanding and becoming more inventive, with new sources of finance becoming available. Some very good projects were, however, being held up by political and commercial difficulties. There were some areas, such as nuclear investment in the former Soviet Union and central and eastern Europe which the capital markets could not address. There was no obvious solution to the problem of environmental liability and insurance. The problem of investment in efficient energy use and renewable energies might be better considered as a general question of industrial and small business policy rather than addressed to the large lending agencies.
- Mechanisms to avoid or mitigate the risks of arbitrary government action were increasingly in place – the Charter Treaty, intergovernmental agreements, official insurance like OPIC. Regulatory risks could, to some extent, be anticipated by offtake guarantees. There was however a danger that market liberalization and competition would make it difficult to write the long term offtake commitments needed for traditional project financing. Risks also arose if governments abandoned to the market issues like externalities with which the market could not cope.

Mitchell's personal impressions in fact constituted an authoritative summary of the main themes of the conference. The range of his points demonstrated the benefits of the decision of the Royal Institute and associated bodies to move the 1995 conference from its traditional themes of energy policy and economics to the question of finance for energy investment. The conference met a clear need in its large audience. It brought together participants from the financial and energy communities although it left unresolved some differences of approach between them. It also identified issues, notably in connection with the financing of investment in efficient energy use, a rethinking of the role of government in changing energy markets and the introduction of new environmentally friendly technology – a point stressed by Ruud Lubbers – which should provide the basis for further successful conferences.

David Jones

Belarus Workshop Notes (continued from page 7)

Foundation. Topics included energy saving, efficient energy production and distribution and ecology. In all, 75 reports were presented.

Hopefully, the workshop will contribute to the formation of a workable energy policy for Belarus and perhaps other Eastern European countries as well.

Leonid P. Padalko
Byelorussian Polytechnical Academy

Conference Announcement

IEW/JSER'96

Joint IEW/JSER International Conference on Energy, Economy, and Environment

June 25-27, 1996

Osaka University Convention Center, Osaka, Japan

The following topics will be covered:

- National, regional, and global energy projections.
- Energy resources assessment: fossil fuels, renewables, and nuclear resources.
- Analysis of energy-economy interactions.
- Innovative energy technology in supply, end-use, and environmental protection.
- Policy analysis of climate change issues.
- Energy conservation and efficiency policies.

Sponsoring Societies:

International Institute for Applied Systems Analysis (IIASA)
Japan Society of Energy and Resources (JSER)

Collaborating Societies:

Power Engineering Society of Institute of Electrical and
Electronics Engineers (IEEE)
International Association for Energy Economics (IAEE)
Research Institute of Innovative Technology for the Earth
(RITE)

**Registration Fee: ¥30,000 before April 30, 1996
and ¥40,000 thereafter.**

The conference program will include technical and discussion sessions on the above topics. Some sessions for plenary and invited papers are also planned. Industrial visits and social programs will be arranged during and after the conference. The official language throughout the conference will be English.

The conference will be held as a joint meeting of the JSER and the International Energy Workshop (IEW). JSER has organized an annual Energy Systems and Economics conference for more than ten years; the IEW has jointly organized annual meetings since 1981 in the USA and Austria. The joint meeting will include important features of the traditional JSER and IEW meetings. It will include discussions around the results of the IEW Poll on energy projections and also feature sessions on broader energy and environmental topics such as CO₂ control and recycling technologies.

For Further Information Contact:

Assoc. Prof. Pyong Sik Pak, Secretary of NOC, Dept. of
Info. Systems Engineering, Faculty of Engineering, Osaka
University, 2-1 Yamadaoka, Suita, Osaka 565, Japan.

Tel: +81-6-879-7831. Fax: +81-6-879-7832.

E-mail: pak@ise.eng.osaka-u.ac.jp.

**IA
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A Special Invitation to USAEE and NCAC Members

The National Association of Business Economists Invites You to Attend
The Twelfth Annual NABE Washington Policy Seminar
A New Policy Regime: The End of Incrementalism
March 12-13, 1996
The Capital Hilton, Washington DC

Overview

The U.S. has entered into a new policy regime. Old paradigms are gone. NABE's policy seminar will provide the background within which future energy policies will be shaped. Attend this seminar to learn more about the new Congressional budget policy and tax reform, the Fed's current thinking on monetary policy, the Administration's views on the economy and more.

Schedule and Topics

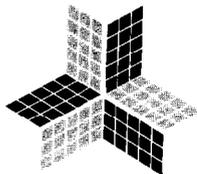
The NABE Washington Policy Seminar will follow the USAEE/NCAC Washington Energy Policy Seminar on Monday, March 11. The NABE seminar will begin at 1:00 pm on Tuesday, March 12 and will adjourn by 4:30 pm on Wednesday, March 13. Confirmed speakers are Congressman Bill Archer, former CBO Director Rudolph Penner, Federal Reserve Governor Janet Yellen and Deputy Secretary of the Treasury Larry Summers. CEA Chair George Stiglitz will provide remarks at a reception at the Old Executive Office Building. Issues to be discussed will include:

- What is the status of the newly proposed tax reform initiatives? How will they impact U.S. business? How will budget cutbacks affect Federal government services and programs, both nationally and regionally?
- What is the Fed strategy regarding employment, inflation and interest rates? Will Congressional legislation influence the strategy? Who is proposing changes in regulation and why? What will be the impact on the real economy?

Exchange ideas with private sector experts and government leaders during the reception on Tuesday evening and during the meal functions and coffee breaks on Wednesday. *Special rates will be available for those attending the both the NABE and the USAEE/NCAC seminars.*

More Information

To receive a brochure, complete this coupon and send to:



1996 Policy Seminar
National Association of Business Economists
1233 20th Street NW, Suite 505
Washington, DC 20036
Phone: 202-463-6223 Fax: 202-463-6239 E-mail: busecon@cpcug.org

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Organization _____
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Phone _____ Fax _____

Energy-The Key to an Ecologically Sustainable Development

by Bruno Fritsch*

We do not consume resources but different states of energy. If a certain resource is "depleted," its material components have not become inexistent (law of conservation). Rather, this resource or its component parts are not available with the proper concentration, in the proper place, and at the proper time. Given the present level of knowledge, these three requirements – availability in terms of proper concentration, place, and time – can be fulfilled for practically all elements of the periodic system. This, however, requires energy. For this reason, the resource or raw material problem is "reduced" to the problem of energy – "the ultimate resource," as Goeller and Weinberg rightly observed 16 years ago in their pioneering paper "The Age of Substitutability."

Energy is the crucial issue of the environmental problem. Under present circumstances, both the supply (generation) and the use (consumption or utilization) of energy is related to material dissipation. Unlike the dissipation of energy which is the inevitable result of energy utilization, i.e., the conversion of high energy levels to lower energy levels (waste heat), dissipation or concentrations of materials can be transformed via terrestrial sinks or dilution to such an extent that their concentration is compatible with man's living conditions and social existence. In ideal circumstances, what remains is the waste heat which is eventually released into the deep of space.

Managing a sustainable cycling of materials – the prerequisite for man's continued existence on earth – is a difficult task. First, what matters is not only the concentration of a particular toxic substance, but also the speed of both its production or composition and its decomposition (residence time). Second, due to the non-linearity of ecological systems, a particular concentration of toxic substances in the different strata of the ecosystem (hydrosphere, atmosphere and lithosphere) might effect sudden and principally unforeseeable phase transitions. Obvious examples are the eutrophication of a lake or changes in the composition of the atmosphere. As a rule, these phase transitions are irreversible, establishing a new quality of the overall system.

Moreover, we do not know the long-term effects of certain environmental influences on man, e.g., the long-term effect of weak radiation; therefore, we are not sure whether – and if so, when – we have to reckon with health damages.

There are still other reasons why an ecologically optimum management of material cycling appears to be rather difficult. But it is not impossible. Today, it is both technically and economically feasible to realize integral product cycles: the whole production process – with its preliminary products, product components, the means of production (e.g., machines) as well as the manufactured product – is structured in such a way that, after the use of the product, its component parts can be reduced to the original materials at minimum costs in terms of energy and dissipa-

tion. We are already on our way to realizing such an integrated material conversion cycle. Within this cycle, using a particular material configuration as an investment or consumer good, i.e., providing the required service for investment or consumer purposes, constitutes only one single phase.

The realization of an integrated material conversion cycle with the attendant service phase requires stimulation by economic incentives which, on their part, must comply with certain laws and regularities. For example, these incentives must not possess the character of parametric regulations but should rather be designed as universally applied marginal conditions that, in ideal circumstances, do not effect market distortions. As a rule, measures imposing limits on certain emissions prove to be an adequate tool as long as it is technically possible to conform to these limits and as long as the costs of the technologies involved are financially acceptable. It is in this context that, at plant level, industries and institutions can benefit from the chance of implementing "eco-efficiency" by providing for production processes with maximum efficiencies and small losses of materials, i.e., configurations of materials which, under the prevailing technological and economic marginal conditions, appear to be of waste character, thus requiring deposition in non-dissipating sinks.

A decisive factor in this context is the speed with which both individuals and societies succeed in increasing their knowledge. Basically, this is an open and essentially infinite process. What is new is the interaction between natural processes and anthropogenic processes, with an increasing impact of man's activities on naturally occurring changes. For example, in the case of aerosols, the anthropogenic influence has reached 40 to 50% of the amount of natural aerosols transported into the atmosphere due to desert storms. Moreover, substances are given off to the various strata of the ecosystem which did not naturally occur in the system, e.g., CFCs or plutonium.

Two basically different kinds of knowledge require close interactions: (1) knowledge in terms of achieving scientific progress, and (2) knowledge in terms of its practical and political application. Two well-known examples are the prudent use of nuclear energy and the application of gene technologies. When it comes to making use of knowledge, the interaction between natural and anthropogenic processes is paralleled with the interaction of systems exhibiting different time constants. In other words, the time scale of man-influenced ecological processes differs from the time scale of political decision processes.

Considering this situation, we have to gain time and perspectives:

- by intensifying scientific research work in ecologically relevant areas;
- by making combined efforts to increase our knowledge about environmental resources and energy economics; and
- by carrying out precautionary measures to achieve decelerated rates of energy and material consumption by means of increased efficiencies.

A major political task is the constant search for ecologi-

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(continued on page 24)

The IEA Gas Security Study

By Bjorn P. Saga*

When the IEA was founded in 1974, the security concern was paramount. It was oil-fused and emphasized self-sufficiency. Perceptions of scarcity of natural resources, especially oil and gas, underpinned a near consensus that prices were bound to rise forever, and that governments had to do something about it, that oil was too important to be left to industry and markets alone. Since then IEA countries have succeeded as a group in reducing both the level of oil consumption and the share of imported oil. However, imports of natural gas from non-IEA sources have grown. Therefore, in 1993, IEA Ministers requested the IEA Secretariat to undertake an analysis of the future of natural gas supply and demand in the three OECD regions (Europe, North America and Pacific), and the regional security issues that might arise from increased dependence on external supplies. Ministers had in mind, not only the growing interest in natural gas as a clean fuel, but the prospect that IEA gas supplies will be increasingly sourced from countries outside the IEA region, progressively distant from consuming centers, traversing countries whose reliability as transit states is in question.

The results of the study were presented to Ministers earlier last year and have now been published. Starting from the dictionary definition of security as "*the state of being safe against adverse contingencies*," such as disruption or non-availability of supply, the study identified three broad classes of risk:

- **Technical Risk.** Owing to an accident, terrorist incident or natural catastrophe, a major supply facility is put out of action, but at worst, for only a few months.
- **Failure to mobilize long term supply or ensure deliverability.** This refers to "non-availability" of supply where sufficient capacity for consuming, delivering or producing gas does not materialize. In Europe and the Pacific, gas tends to be developed in large tranches: it requires long lead times, and is predicated on uncertain growth projections.
- **Political Risk.** This includes long-lasting disruptions for politically motivated reasons, or economically available supplies from a particular source are not mobilized because political risks are too high.

While it may be impossible or too costly to ensure absolutely against all of these risks, a number of measures can be taken which will either reduce the chances of disruption occurring, or at least reduce its impact if it does. First of all, basic principles apply for bolstering supply security of any input: maximize diversity and flexibility among suppliers and geographic sources; develop responsive emergency systems; introduce free and open trade and a secure framework for investment (in new supply); and, cooperate among all energy market participants to improve transparency of market infor-

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mation. These principles are in fact all found among the IEA's "Shared Goals" – its mission statement, agreed by IEA Ministers in June 1993.

How do these principles relate to gas security? Approaches differ but diversity is key. In North America, where the natural gas industry has been in existence for more than a century, diversity comes from the great number of producers and transport options. In Europe, it refers to the number of supplying countries and supply routes. In Japan, it is the number of LNG supply trains and source countries.

Emergency response measures are especially important in the gas sector: they include the use of surge production capacity, storage, interruptible contracts, demand restraint and supply sharing under contingency planning agreements among gas companies, or, in extreme cases, intervention by governments.

But who is responsible for implementing these arrangements? In free markets, individuals look after their own risk using a variety of tools and tactics. Gas markets, however, tend to be imperfect mostly because of monopoly in transmission and transport and the lack of transparency of market information. Ensuring security of supply – risk management – especially technical and market risks, is the domain of the gas companies who, after all, make the large capital investments. Governments, however, have a role in setting the framework within which risks can be managed, ensuring that market mechanisms serve as the basis for security decisions. Governments might also have a role in ensuring that what is acceptable risk for smaller customers is defined and accounted for in industry operations and business practices.

In assessing the outlook for Western Europe, we used a simple approach to assess the long term security of supply of natural gas. We gathered forecasts from all IEA member countries in Europe. Because the assumptions used by each country were not the same, we compared the aggregated results with those of our own regional econometric model: the one used in the IEA World Energy Outlook that we published in April 1995. The forecasts are very similar. The most conspicuous feature is the projected strong growth in demand for gas in power generation, accounting for nearly 50 percent of total gas demand growth, of about 70 percent, out to 2010.

Our analysis also indicated that at a gas price corresponding to an oil price of US\$ 28 per barrel, there would be in principle no problem in meeting this supply. At a supply price corresponding to an oil price of US\$ 18 per barrel, it might be more difficult to bring the needed gas volumes to market. But costs are not static. As an aside here, it may be noted that in June 1995, the IEA organized a workshop on gas security where a number of key representatives from the European gas industry were invited to give their feedback on the draft of the study. The discussion at that meeting was lively, but at least there was one point on which all the participants agreed: there is scope for cost reductions all along the gas chain. Recent reduction in production costs in North America and the North Sea have demonstrated this very clearly. The major challenge faced by the gas industry, however, is to reduce transportation costs.

Risk reduction which, in turn, could contribute to cost reduction, is another key point when discussing future supply

(continued on page 24)

Sustainable Development (continued from page 22)

cally sound and technologically feasible limits to be imposed on emissions – depending on the level of knowledge achieved in the ecologically oriented natural sciences. This process leads to the formation of prices for environmental goods which have to be made mandatory upon all those concerned. It is on this basis that a calculable eco-efficiency appears to be possible at all.

In terms of politics, we are moving in an area between “random walk” and parametric regulations. A combination of advanced growth theory allowing for continuous increase in knowledge, non-linear dynamics and institutional theory will bridge the gaps between natural sciences, economics, and politics. This is the way to increase our scarcest good, the scarcest of our resources – our capability of making political use of our knowledge via the internalization of scientific results. This is the chance of reaching economic and ecological convergence. As Lubbe is right in observing, nature is threatened not by economization but by romanticization. Making prudent use of nature and of ecological systems does not harm the environment but rather creates the basic conditions for achieving an ecologically sustainable economic growth.

We still have a long way to go. A noticeable improvement of both the regional and the global environmental situation is not to be expected unless population stabilization is reached. The level at which this stabilization is realized is far less important than the point of time of its realization. The earlier this stabilization is achieved, the greater is our chance to improve the situation of the people living in the developing countries of the Third World without adding to environmental hazards. Only then can we ensure an ecologically sustainable economic growth. Only then can we hope that man is in a position to solve the three conflict areas: his conflict with nature, his conflict with his fellow men, and his conflict with his own inner world. Only then will mankind be capable of entering a new phase of cultural evolution.

The IEA Gas Security Study (continued from page 23)

projects. Risks can be reduced, for example, in supply contracts for power generation by de-linking gas and oil prices. Also, the perceived political risk could be reduced by

putting in place a stable legislative and institutional framework for investment. The Energy Charter Treaty offers a basis for such a framework. Since Russia will be the swing supplier of gas to Western Europe, and its gas must transit other Treaty signatories, progress in the Treaty’s implementation is important. The IEA has, by the way, recently published its first energy review of Russia where aspects of the Russian gas sector have been dealt with in addition to those included in the gas security study.

No European OECD country has ever been hit by a major disruption in gas supplies. Nonetheless, various disruption scenarios around disruptions of Algerian and Russian supplies were developed. These examples were chosen because they involve sufficiently large volumes to test the system, more so than, say, a future disruption of supplies from the Troll platform.

The analysis tried to answer the following question: How long could the gas companies go on supplying their firm customers if either Russian or Algerian supplies were interrupted, under reasonable assumptions about the use of storage, interruptible contracts and other response tools? The main message is that, in the event of a cut-off of supplies, France, Germany and Italy, the largest importing countries, are able to supply their firm customers for quite some time – more than 24 months in some cases. Countries such as Spain and Turkey, still with limited storage capacity, would run into problems very quickly, although both these countries are rapidly strengthening their contingency systems.

Looking at energy security from an IEA perspective also involves an examination of the effects on other fuels stemming from disturbances in gas supplies. The analysis in this area concluded that the heavy fuel oil market would be significantly affected by a major gas supply disruption. If Russian gas supplies were cut off, heavy fuel oil demand could increase by half a million barrels per day, which is slightly (15 percent) higher than the increase in demand caused by the U.K. miners’ strike in the mid-eighties. That event had major price effects. Carrying the scenario forward, it is likely that fuel oil would be pulled across the Atlantic by the buoyant European fuel oil market. With natural gas filling in behind this displaced fuel oil, the North American gas market would feel the effects of a Russian gas disruption.

The increase in use of gas for power generation in some

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

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countries does not seem to have jeopardized security of supply so far, either from a gas or an electricity point of view. Some of the reasons are spare capacity in the electricity generation system, import possibilities, multifiring possibilities in power stations and wheeling of power.

The security implications of the increased reliance on gas in power generation in the future, approaching more than 30 percent in some gas importing countries by 2010, need to be closely monitored. Prudence might argue in favor of requiring dual firing capability and backup fuel storage in such areas.

It is sometimes argued that gas markets should not be liberalized, deregulated and opened to competition, because security of supply would be threatened. While the European market is not as evolved as the North American, the pressure for more liberalization of the former will likely continue. Our examination of the North American experience with deregulation is that gas deliverability, infrastructure development and price responsiveness have not been negatively affected. Moreover, the North American market was put to the test by the severe weather conditions of 1994 and passed it very well.

We fully realize that the North American and European markets are different in many respects, but we believe that a liberalization of European gas markets need not be incompatible with a high level of security of supply.

In conclusion, IEA countries rely on a mix of measures, appropriate to their individual circumstances, to bolster gas security and are generally well placed to withstand major supply disruptions. But gas supply security protection should be carefully monitored as gas demand grows and those

countries still developing their gas infrastructure need to consider how to improve their security of supply.

The projected growth in demand does not pose a major concern, at least out to beyond the end of the century. Provided that a stable framework for investment and trade is established, supply security for the period beyond should be reasonably assured, although this could be more problematic at gas prices related to current oil prices.

Corrections and Amplifications

IEA Survey of Russian Energy Policies

Guy Caruso of the IEA has advised that his original text for the above article which appeared in the Fall 1995 issue of this *Newsletter* contained an omission. The third paragraph of the article should have read:

"The IEA Russian survey is one of a series of surveys on non-IEA Member Country energy issues (others include Hungary, Poland, the Czech Republic, Romania and South Korea). It is based on the methodology we use for our Member Country surveys. Our goal is not to make technical recommendations, but to *concentrate on getting the policy framework right*, so that the most rational technical decisions could be made. There is no doubt that in the process of reforming its energy sector, Russia is increasingly integrating its energy economy with the international one. A recent concrete step in that direction is the political commitments Russia developed and accepted under the European Energy Charter Treaty. This momentum of reform in the energy sector should be maintained."

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Privatization of the Hungarian Energy Industry

By Tamas Jaszay Jr. and Eniko Kiss*

Following the fall of the iron curtain, it became clear that Hungary lacked the required capital to carry on the necessary improvement and development of its energy sector and that the needed capital would have to come from foreign sources. The first step in the privatization of the large state-owned energy companies was the incorporation and unbundling of them so as to make them more attractive to investors.

Central planning of the electricity industry was ended in 1991 and the state-owned electricity company converted to a corporation, MVM Rt. MVM Rt. became a holding company for six regional power distribution companies, seven power station companies and the high transmission grid company. It was also responsible for imports and exports. MVM Rt. then purchased electricity from the power companies and sold it to the distribution companies.

In 1991, the Hungarian Oil and Gas Trust (OKGT) was also split up and converted into a corporation. The regional gas distribution companies were split off and what remained converted to a corporation called MOL Rt. This included oil and gas exploration, production, refining and retail distribution and high pressure gas transmission.

An effort was made to privatize both the gas and power distribution companies prior to the establishment of an adequate legal framework (1992-93) but these efforts had to be aborted due to the very low prices offered and high uncertainties surrounding the operations. Bids for the electricity companies, for example, were 60% of nominal value.

Privatization Strategies

Following these problems the government hired professional financial investors to manage the process: Lazard for MOL, Rothschild for the gas companies and Schroders for the power industry. In addition, targets to be achieved by privatization were defined, namely:

- To create an environment conducive to a reliable long term supply of energy at reasonable prices,
- To raise revenue for the national budget,
- To create the financial resources necessary for development,
- To install market oriented, professional financial management at the companies, and
- To promote the integration of the country with the European Union.

Privatization strategies were worked out and approved by the government in December, 1994. These strategies were later adjusted as needed to the actual circumstances.

MOL Rt.

At first the objective of the MOL privatization was to improve operations through the establishment of joint ven-

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tures at the sector level (exploration and production, refinery, gas transmission, etc.) with the expectation that after the needed improvements the company would be sold through a public offering. Later this strategy was changed and the government decided to sell a minority interest through a private placement to foreign and Hungarian financial investors, while it kept a 25 percent + 1 vote stake together with a *golden share* (i.e., an ownership residual giving the government special rights). Employees were offered small blocks of shares.

The Gas Distribution Companies

In the case of the gas distribution companies (GDCs) the government decided to sell a majority stake (50 percent + 1 vote) to strategic foreign investors while again, keeping a *golden share* with special rights for itself. Forty percent of the shares were allocated to the municipalities based on their former contribution to the development of distribution networks. The rest of the shares were to be offered to employees or kept for compensation.

The Power Industry

Once unbundled the electricity industry operated in this fashion, but with MVM influencing the decisions of the generating and distribution companies through its ownership rights. In 1993, the loss-ridden coal mines went bankrupt and were integrated into the power generating companies to which they were supplying coal. Through this move coal mining costs were sharply reduced.

The basis of the privatization strategy for the electricity industry was to keep the unbundled structure and sell the companies separately to foreign industrial investors thus creating competitive conditions in generation and enhancing "least cost" operation for the entire industry.

Accordingly, the decision was made to sell a minority interest in the distribution companies together with an option to raise this stake to a majority at the end of 1997, with the government keeping a *golden share* for itself. The government agreed to allocate a 25 percent stake to the municipalities, too, similar to that done with the GDC's. A 25 percent + 1 vote stake was offered for MVM that included the national grid company and the Paks Nuclear Power Station.

Minority interests in the generating companies were also offered together with either (1) an option to raise the stake to a majority, similar to what was done with the distribution companies, or (2) the opportunity to acquire a majority by making capital investments in specified development projects.

The Regulatory Framework for the Industry and for Privatization

The Gas and Electricity Act

The gas and electricity acts were approved by the Parliament in May 1994. These acts now serve as a basis for the operation of the Hungarian energy industry. They define the roles and the responsibilities of all parties. The most important elements and principles of these acts are:

- the establishment of an unbundled (generation-transmission-distribution) power industry structure,
- the separation of rights and obligations of the gas industry

transmission and distribution companies,

- the establishment of the Hungarian Energy Office, as the body for regulation and consumer protection,
- the definition of licensing procedures and conditions,
- the establishment of the principle of "least cost", meaning that where applicable the cheapest solution has to be selected by the companies (development, import, etc.),
- the establishment of the principle that consumer prices must be set so as to cover all reasonable costs of the energy companies including environmental costs, plus an average 8 percent profit, and
- the establishment of the areas where regulation has to be accomplished by government decree and resolution.

The Privatization Law

The Privatization Law was approved by Parliament in the middle of 1995 creating the organization as well as the rules for selling state owned assets. The State Privatization and Asset Management Company was founded by the merger of the two former organizations responsible for privatization. The appendix of the law defined the ownership percentage which the state wished to keep over the long term. This was especially important for infrastructure companies, like those in the energy sector.

The Hungarian Energy Office (HEO)

The Hungarian Energy Office is one of the most important parties of the Hungarian energy industry. The HEO is a governmental organization reporting to the Minister of Industry and Trade. Its most important tasks can be summarized as follows:

- licensing of the gas and electricity companies, including development projects,
- regulation of natural monopolies in the gas and electricity industries,
- ensuring satisfaction of consumers demand and the standards of service, the protection of consumers,
- controlling the costs of the companies and enforcing the principle of "least cost," and
- making proposals to the Minister of Industry and Trade on pricing issues.

The HEO prepared and issued all operating licenses in 1995, which defined the supply areas and the scope of activities of the companies and worked out the operational code for both by the electricity and the gas industry. The execution decrees for the energy acts were also drafted by the HEO and later approved by the government.

Pricing

To reach an attractive pricing system and price level in the energy sector was a crucial objective of privatization. This would have a substantial impact on government revenues.

Accordingly, prices were increased by the Government based on the proposals of the HEO in several steps, starting in January 1995 (65 percent and 53 percent increase for gas and electricity household prices, respectively), fol-

lowed by another increase of 8 percent in September 1995.

The government also determined that price increases in 1996 will take place in March (an average increase of 18 percent for electricity and 25 percent for gas) and October (the extent of which is to be determined after a thorough review of costs by the HEO). The aim was to gradually secure an 8 percent yearly profit for the energy industry from 1997.

Government resolutions include gas and electricity pricing formulas which allow for inflation, changes in exchange rates and an efficiency factor as well. These formulas, which are very similar to those in Western Europe, will be effective from 1997 to 2001. After 2001, a detailed review of the whole pricing system will follow.

The Transactions

From the beginning, foreign investors, including large European and American utility companies, showed considerable interest in the privatization of the Hungarian energy industry.

The tenders for all the electricity and gas companies were issued by the State Privatization and Asset Management Company (July and August 1995) with the exception of FOGAZ, the gas distribution company of the capital city of Budapest. This tender (under somewhat different conditions) was issued by its sole owner, the Municipality of Budapest.

At the same time, MOL approached the potential financial investors with a "road show" presenting the company and answering questions.

Bids were submitted in November.

The Results

The Gas Distribution Companies

The results of the gas distribution tenders were published in the second half of November. The most successful bidders were Gaz de France winning EGAS in the Northwest and DEGAS in the South; the consortium of Italgas and SNAM acquiring TIGAZ, the biggest gas distribution company in the Northeast of the country; while the Ruhrgas-VEW consortium from Germany got DDGAS in the Southwest and FOGAS in Budapest. The German-Austrian consortium of Bayernwerk and EVN acquired KOGAZ in the Southwest region.

In most cases prices for the stakes of these companies were unexpectedly high. Most prices exceeded 200 percent of nominal value and the highest offer was well over 400 percent. This high level of proceeds positively influenced the offers for the electricity companies as the tender submission deadlines for these were a week later.

The Power Distribution Companies

In the acquisition of the power distribution companies, German investors played a dominant role. Four of the six companies were privatized by German investors. ELMU in Budapest and EMASZ in the Northeast were acquired by the consortium of RWE Energie and EVS; TITASZ in the East was taken by Isar Amperwerke, while DEDASZ in the Southwest was purchased by Bayernwerk. The remaining

(continued on page 28)

Hungarian Energy Industry (continued from page 27)

two companies, EDASZ in the Northwest and DEMASZ in the South, were acquired by Electricite de France.

Prices for the 46-49 percent stakes of these companies were also relatively high, however, somewhat lower than for the gas companies.

Power Generating Companies

The level of success was a bit lower on the generation side of the electricity industry. A minority interest in only two of the six offered companies was sold: Dunamenti Power Station to the Belgian Powerfin-Tractabel and Matrai Power Station to a consortium of RWE Energie and EVS from Germany. For the rest of the power stations either the prices were unacceptably low for the government or there were no offers at all. The reason for this is the poor condition of these, mostly coal fired units, the environmental problems and their obligations for district heating, the pricing of which is confusing and still has social elements.

It was quite surprising that neither British nor American companies acquired a shareholding in any of the power and gas companies in spite of their strong interest and in certain cases long local presence.

MVM

There was only one offer for the 25 percent of MVM which owns the only nuclear power station in Hungary. This offer was relatively low and could not be accepted by the evaluating bodies.

MOL

Eighteen and a half percent of MOL, the Hungarian Oil and Gas Company, was acquired by mostly American and British institutional investors through private placement. Another 3 percent was sold to Hungarian individuals and institutional investors during December. Employees and managers of MOL also purchased small shareholding at beneficial rates. Prices were at 1100 HUF/share, at the lower end of the indicated range.

The Next Steps After The Privatization

The Government is working out a strategy for the companies, with special regard to the power generating companies, which will remain in state ownership in the spring of 1996. The aim is to operate them more effectively and to try to make them more attractive for foreign investors in the future. This will offer opportunities for investors to be involved in the next round and become major players in the Hungarian energy industry, which will need enormous injections of capital in the next ten years.

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Should Oil States Hedge Oil Revenues?

Oil hedging experts from around the United States met with Alaskan state leaders on Friday, October 13, 1995 at the University of Alaska, Anchorage Business Education Building for an all day workshop entitled "Should Oil States Hedge Oil Revenues?"

Alaska Compared to Oil Companies and Oil Sovereigns

To understand if Alaska can hedge like oil companies and oil sovereigns, David C. Shimko, J.P. Morgan Securities, made the following comparisons: Alaska is similar because like oil companies and oil sovereigns, they bear the oil price risk associated with high production levels. Alaska is different, however, in that the state does not explore for new oil or manage its oil assets. When oil prices fall, producers cut back exploration and production to save costs while sovereigns can withhold production or collude to raise world prices. Alaska's exposure is passive, however, since it does not manage assets and cannot unilaterally undertake actions to influence world prices. When oil prices fall and producers cut back, Alaska experiences lower prices on fewer barrels without the compensating effect of lower operational costs. Alaska feels the impact of lower prices immediately as oil revenues have historically driven state budgets.

Shimko advised comparing Alaska to an underdiversified investor rather than to either an oil producer or an oil sovereign. Looking at Alaska's public portfolio, Shimko estimated the current value of the oil reserves to be \$30 billion, the value of the Alaska Permanent Fund to be \$15 billion, and miscellaneous revenues \$3 billion. In other words, oil represents 62.5% of Alaska's public wealth, and no investor should put that much of a portfolio into oil. Alaska needs to diversify; hedging is one way to transform nondiversified oil price risks into a portfolio of diversified risks.

The Size of Alaska's Exposure

On an annual budget of about \$2 billion, unexpected oil price decreases can erase one-fourth of Alaska's state budget. "This occurred in fiscal year '94," said Mary Lindahl, University of Alaska, Fairbanks, "in March 1993, the Alaska Legislature budgeted operating and capital expenses for the coming fiscal year based on a mid-case oil price forecast of \$18.38 per barrel. But by mid-December, ANS prices had dipped below \$10 and Alaska was facing an expected deficit of more than \$500 million." Much of this deficit could have been avoided if Alaska had locked in forward oil prices at the time the budget was approved.

The most recent month is yet another example of Alaska's exposure to oil price volatility. Michel Brogard, Lehman Brothers, showed that if Alaska had hedged 100 percent of its oil position (about nine million barrels per month) with five year swaps on September 10, '95, that the mark-to-market of these swaps would have been a positive \$300 million by October 10, 1995. Not only had oil prices decreased during the month, but the whole forward oil curve had decreased. "That is a substantial amount of money in a short time," Brogard understated, "and with that kind of price volatility, to hedge at least a portion of the oil price exposure

seems a prudent thing for Alaska to do.”

Risk Management Tools for Alaska

With the continuing development of derivatives and capital markets, Alaska's tools for managing financial risk are becoming increasingly effective. Alaska can lock in forward oil prices using WTI futures, WTI swaps or ANS swaps; Alaska can buy insurance on its oil revenue using WTI options; and Alaska can convert its oil dividends into a security which can be sold to investors willing to bear oil price risk (securitization.) At current prices, Brogard reported that Alaska could lock in the Department of Revenue's high case price scenario with swaps, and that Alaska could protect the low case price scenario with put options for less than 5 percent of Alaska's annual budget (\$100 million per year).

Securitization is an intriguing possibility as it avoids both basis risk and credit risk and can protect prices for up to ten years. Securitization, Shimko reported, reaches the largest possible audience for selling Alaska's exposure. The potential success of this tool is hard to assess, however, until a marketing study evaluating investor preferences is done.

The WTI instruments all have basis risk, the risk that the difference between WTI and ANS oil prices will change. Though basis risk is smaller than overall price level risk (oil prices have fluctuated from \$9 to \$41 per barrel while the basis has varied from \$0.80 to \$4.20) basis risk is still considerable. The potential of losing money due to a disadvantageous change in the basis while hedged must be evaluated.

Exchange traded futures and options on futures have no credit risk, are flexible – meaning that trading decisions can be modified or reversed easily, and have transparent prices – meaning that prices are easily observable on a computer screen. Over-the-counter swaps prices, by comparison, are discovered by calling several swap counter-parties. Options might be the most politically correct tool as they can be compared to insurance. However, the duration of price protection is less than nine months with options. By comparison, at least some portion of futures hedging could go out two years, swaps could go out five years, and a security could approach ten years.

To what extent Alaska should hedge, depends in part on the choice of the hedging tool. Futures and options have limitations due to market thinness beyond nine months. Philip Verleger, Charles River Associates, recommended that no more than 10 percent of the outstanding open interest in any month should be hedged by any one player. Recent open interest figures for WTI were 54,000 contracts (54 million barrels) in the first month, and 3,000 contracts 12 months out. Alaska's total exposure is roughly 9 million barrels per month. Therefore, Alaska could hedge (under the 10 percent rule) 60 percent of its production one month forward, and only 3 percent of its exposure 12 months forward with futures. Brogard noted that forward oil prices are sensitive to big market players and Alaska should act discretely if it decides to hedge a large portion of its forward oil price exposure in the paper markets.

WTI hedges are easier to execute than ANS hedges, as

ANS markets are more limited than WTI markets in both volume and maturities. While Alaska absorbs basis risk with a WTI hedge, this could be to Alaska's advantage as Brogard reported that ANS is expected to strengthen relative to WTI in the next few years. If the oil ban is lifted, noted Shimko, a WTI hedge could especially be to Alaska's advantage.

Learning from the Texas Experience

Linda Patterson of Patterson Associates and Dennis Weinmann of Coquest emphasize that education of risk and risk management is the first step to be addressed when implementing a state hedge program. Texas passed through this phase very quickly, likely due to the fact that many State legislators engage in oil-related or agricultural businesses and were already familiar with the concept of hedging as a risk-reduction strategy. In 1991, Texas State Senator Teel Bivins introduced Senate Bill 1033 that authorized a two-year pilot hedging program. Expanded legislation was passed in 1993.

Based on the Texas experience, authorizing legislation should not address types of hedging strategies or the tools to be used. Rather, the legislation should empower an oversight board to make those decisions. Given the slowness of any political process, using an oversight board that is already in place is ideal. Texas, for example, assigned the responsibility to their State Depository Board, composed of the Treasurer, the Comptroller, the State Bank Commissioner, and a citizen member. The Board was already charged with reviewing certain investment areas and took on the supervision of the state hedging program as an additional task.

A system of checks and balances with separation of responsibilities is a necessary part of any hedge program and is crucial to the success of a state hedge program. Patterson and Weinmann recommend the following key components: Treasury supervision, Oversight Board Supervision, Risk Management Group Trading, Banking Function, Accounting Function, Broker/Clearing Agent, and an External Audit.

A state hedging program should be viewed as a way to better predict and protect oil revenues and as a tremendous aid to the budgetary process. While hedging should not be viewed as a way to win or lose money for the state, Patterson identified the political risk of “losing” money early in a hedging program and problems that can be encountered with press coverage. Her advice is GO SLOWLY.

Should Alaska Hedge or Not?

Rationales in favor of hedging include: (1) revenue shortfalls can have a disastrous effect on the state budget; (2) hedging can provide for better prediction and protection of the budget; (3) knowing the budget in advance helps planning at all government levels; (4) Alaska needs to diversify as state revenues are 75% dependent on oil; and (5) politics have prevented a two-way cash flow from the Alaska Permanent Fund. Rationales against hedging include: (1) oil is a good long-term investment; and (2) Alaska can begin its own oil price stabilization fund by maintaining a reserve.

(continued on page 30)

Should Oil States Hedge Oil Revenues?

Conclusions

- At the end of the workshop, sentiment definitely favored hedging. "Alaska is a farmer of oil," says Brogard, "and farmers have hedged their crops for more than a century. Alaska has almost a fiduciary responsibility to hedge. How can Alaska continue to do nothing when the oil producers are hedging their revenues?"
- The choice of the ideal hedging instrument is not obvious. Opinions differed on whether to pursue a futures hedge, options insurance, a swap, a securitization plan, or a combination of the different tools. As Brogard said, "the actual decision to manage volatility and implement a price hedging program is really the key. The hedging instruments most suited will become obvious as the goals of the program are developed and defined by the hedging committee."
- Alaska should promptly initiate a pilot hedging program and an education effort to gain "hands on" expertise and public awareness. If Alaska has in place a hedging capability and another world event takes place to drive up prices, Alaska could take advantage of the opportunity to lock in high forward oil prices.
- While hedging alone cannot solve Alaska's fiscal gap, closing the gap and locking in prices through hedging are interrelated problems. "For example," said Shimko, "assume Alaska can fill in its current fiscal gap. Later, if oil prices fall significantly, Alaska is immediately faced with a new fiscal gap. Thus, a closed budget gap can stay closed if oil revenues are secured."
- Hedging is superior to maintaining a reserve as a method of smoothing a volatile revenue stream. Saving windfalls to cushion shortfalls is difficult, and government forecasts of oil prices are typically overestimated.
- Alaska can elect to establish different hedging percentages for different time periods. Since the markets are deeper in near months, Alaska can hedge a higher percentage of its

oil revenue near-term. Alaska can then progressively increase the hedging percentages as time elapses.

Mary Lindahl

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Publications

Oil & Caviar in the Caspian: A Balance of Power & A Balance of Interest (1995). Price: £95 European Price, £110 Non-European Price. Contact: Menas Associates Ltd., P.O. Box 513, London E17 6PP, United Kingdom. Phone: 44-181-520-8067. Fax: 44-181-520-1688.

Utility Organizations of the World (1995). 450+ pages. Price: \$780.00. Contact: ABS Energy and Power, 32/33 High Street, Ascot, Berkshire SL5 7HG, United Kingdom. Phone: 44-1344-291828. Fax: 44-1344-291024.

Energy Outlook for the Former Soviet Republics (1995). Price: \$4500.00. Contact: PlanEcon, Inc., 111 Fourteenth Str., NW, Ste. 801, Washington, DC 20005-5603. Phone: 202-898-0471. Fax: 202-898-0445.

Coal: Resources, Properties, Utilization, Pollution (1995). 500 pages. Price: \$100.00. Contact: Dr. Orhan Kural, ITU, Mining Faculty, Maslak, 80626 Istanbul, Turkey.

World Power Map (1995). Price: \$120.00 Contact: The Petroleum Economist Ltd., PO Box 105, Baird House, 15/17 St Cross Street, London EC1N 8UN, United Kingdom. Phone: 44-171-831-5588. Fax: 44-171-831-5313.

Ownership and Performance: The International Evidence on Privatization and Efficiency. By Michael G. Pollitt £39.50. Oxford University Press, 57 Woodstock Road, Oxford OX2 6FA, United Kingdom. Phone: 44-1865-311377. Fax 44-1865-310527.

Indonesia: The Political Economy of Energy. By Philip Barnes. £29.50. Oxford University Press, 57 Woodstock Road, Oxford OX2 6FA, United Kingdom. Phone: 44-1865-311377. Fax 44-1865-310527.

Nigeria: The Political Economy of Oil. By Sarah Ahmad Khan. £29.50. Oxford University Press, 57 Woodstock Road, Oxford OX2 6FA, United Kingdom. Phone: 44-1865-311377. Fax 44-1865-310527.

Calendar

4-7 February 1996, The North American Energy Summit 1996. JW Marriott Hotel, Houston, TX. Contact: Conference Coordinator, Institute for International Research, 708 Third Avenue, 4th Floor, New York, NY 10017-4103.

4-7 February 1996, The Future of Brazil's Power Industry. Westin Galleria Hotel, Houston, TX. Contact: Mr. Alan Smith, Dir., International Conferences, IBC Conferences, Sydney, Australia. Phone: 61-2-319-3755. Fax: 61-2-699-3901

26-27 February, 1996, Workshop on Electricity Privatization. Bangalore, India. Contact: Prof. V. Ranganathan, Indian Institute of Management, Bangalore, 560076, India. Phone: 9180-6632450. Fax: 9180-664-4050. e-mail: ranga@iimb.ernet.in

27 February - 1 March, 1996, Latin Energy Week in Dallas. Fairmont Hotel. Latin Energy Finance, 27-28 February. InterAmerican Petroleum and Gas Conference (IPGC '96) 29 February - 1 March. Contact: The Conference Connection, Houston Office, Phone: 713-667-1567. Fax: 713-667-3134.

4-6, March 1996, Building Energy. Combined events of 1) 1st International Solar Electric Buildings Conference, 2) 12th

Annual Quality Building Conference, 3) RENEW '96. Boston, MA, USA. Contact: Paul Lipke, Northeast Sustainable Energy Association, 50 Miles Street, Greenfield, MA 01301. Phone: 413-774-6051. Fax: 413-774-6053.

11-13 March 1996, Understanding Energy Derivatives. Mayfair Inter-Continental, London, U.K. Contact: The Customer Services Manager, The International Faculty of Finance, 2nd Floor, Market Towers, 1 Nine Elms Lane, London, SW8 5NQ, England. Phone: 44-171-344-3833. Fax: 44-171-344-0083.

11-14 March 1996, New Renewable Energy Week. Sheraton Rotorua Hotel, Rotorua, New Zealand. Contact: Graham Diedrichs, Energy Efficiency and Conservation Authority, PO Box 37-444, Parnell, Auckland, New Zealand. Phone: 64-9-377-5328. Fax: 64-9-366-0531. E-Mail: graham.d@eeca.ak.planet.co.nz

1-3 April 1996, The 7th Global Warming International Conference & Expo. Vienna, Austria. Contact: Conference Fax Hotline: 708-910-1561 (U.S. number).

14-17 April 1996, Eleventh International Symposium on Alcohol Fuels. Sun City, South Africa. Contact: Professor R K

(continued on page 32)



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Calendar (continued from page 30)

Dutkiewicz, Energy Research Institute, University of Cape Town, PO Box 207, Plumstead, Cape Town, 7800, South Africa. Fax: 27-021-705-6266.

14-18 April 1996, Renewable Energy Conference & Workshop. Cairo, Egypt. Contact: Fuad Abulfutoh, Conference Chairman, c/o National Renewable Energy Laboratory, 1617 Cole Blvd., Golden, CO 80401-3393. Phone: 303-275-3000.

17-18 April 1996, 3rd Annual Utility Strategic Marketing Conference: Shaping the Competitive Environment. Orlando, Florida, USA. Contact: Conference Registrar, Synergic Resources Corporation, 111 Presidential Blvd., Ste. 127, Bala Cynwyd, PA 19004-1008. Phone: 610-667-2160. Fax: 610-667-3047.

27-30 May 1996, 19th IAEE International Conference - "Global Energy Transitions: With Emphasis on the Last Five Years of the Century". Budapest, Hungary. Contact: IAEE Headquarters, 28790 Chagrin Blvd., Ste. 210, Cleveland, OH 44122. Phone: 216-464-5365. Fax: 216-464-2737.

3-7 June 1996, The 6th International Energy Conference and Exposition - Energex '96. Beijing, China. Contact: Liu Feng, China International Conference Center for Science and Technology, 44 Kexueyuan Nan Road, Shuangyushu, Beijing 100086, China. Phone: 86-1-257-5681. Fax: 86-1-257-5691.

24-26 June 1996, Understanding Energy Derivatives. Mayfair Inter-Continental, London, U.K. Contact: The Customer Services Manager, The International Faculty of Finance, 2nd Floor, Market Towers, 1 Nine Elms Lane, London, SW8 5NQ, England. Phone: 44-171-344-3833. Fax: 44-171-344-0083.

25-27 June 1996, Joint IEW/JSER International Conference on Energy, Economy, and Environment. Contact: Assoc. Prof. Pyong Sik PAK, Secretary of NOC, Department of Informa-

tion Systems Engineering, Faculty of Engineering, Osaka University, 2-1 Yamadaoka, Suita, Osaka 565, Japan. Phone: 81-6-879-7831. Fax: 81-6-879-7832.

27-30 October 1996, 17th Annual North American Conference of the USAEE/IAEE - "(De)Regulation of Energy: Intersecting Business, Economics and Policy". Boston, Massachusetts, USA. Contact: USAEE/IAEE Headquarters, 28790 Chagrin Blvd., Ste. 210, Cleveland, OH 44122. Phone: 216-464-5365. Fax: 216-464-2737.

29 October - 2 November 1996, Energy and Power 1996 - EP China '96. China International Exhibition Centre, Beijing, P.R. China. Contact: Mr. Perry Tang, Adsale Exhibition Services Ltd., 14/F, Devon House, Taikoo Place, 979 King's Road, Quarry Bay, Hong Kong. Phone: 852-25163346. Fax: 852-25165024.

25-29 November 1996, International Symposium on Infrastructure of the Future: Power, Transportation, Telecommunication and Environment. Bangalore, India. Contact: Secretary ISF 96, Association of Consulting civil engineers (India), 2 UVCE Alumni Association Building, K.R. Circle, Bangalore 560001, India. Phone/Fax: 91-80-2219012 or 6622001.

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

15-17 January 1997, 20th IAEE International Conference. New Delhi, India. Contact: IAEE Headquarters, 28790 Chagrin Blvd., Ste. 210, Cleveland, OH 44122. Phone: 216-464-5365. Fax: 216-464-2737.

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.

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