IAEE INTERNATIONAL ASSOCIATION FOR ENERGY ECONOMICS

Newsletter

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Third Quarter 2000

President's Message

First and foremost I want to take this opportunity to update you on the IAEE Council's review of strategy which took place before the annual conference in Sydney in June. Our discussion was based upon the belief that the IAEE is the leading international association for energy economics with over 3000 members in 70 countries. It has been established for over twenty years and has progressively been set on a sound financial footing. We, therefore, saw our objective as to provide better services for our members while securing a strong future for the association.

We came to the view that there are two areas where we should concentrate our efforts to strengthen the association. The first is through an enhanced web site to provide more services to members and the second is with regard to student participation in the association.

We intend to expand and improve the IAEE web site. The strength and breadth of our membership gives us a unique opportunity to develop the premier global energy economics portal. We are working on a detailed proposal which is likely to incorporate a full time webmaster, putting *The Energy Journal* on-line (including a full archive), affiliate newsletters, better membership information, enhanced message centers, conference papers, details of Energy Economics/ Studies Degree Courses around the world, etc. We will build a stronger set of links to other energy sites. We also intend to provide free web pages to all affiliates as part of the site. We continue to work on the detail of this proposal and would value any suggestions that you may have.

We also feel that strengthening the reach of the association to students of energy is absolutely critical. It is, of course, part of the *raison d'être* of the association. It is also the best way to generate a strong future membership. Accordingly, we decided to appoint two student advisers to the Council starting in 2001. President-elect Arild Nystad is already working on identifying suitable candidates. We will look to them to press the Council to support the needs of students of energy. We will also expect them to organise student focused sessions at future international conferences. We will also be doubling the student scholarship fund to $20,000 for next year and intend to use the proceeds to support wider student involvement in IAEE conferences and other activities.

A number of other more specific proposals were also approved. We agreed to work more closely with other energy organisations. As part of this we have already agreed involvement of the Society of Petroleum Engineers at future conferences. We would like to extend this process further with other organisations. We also wish to support the serious study of energy economics. To this end we have agreed to fund the production of occasional 'survey articles' on energy economics. The intention is that they can become the base for a future session at an international IAEE conference and there is already broad agreement that this will be implemented for the 2002 conference in Aberdeen.

I hope that you agree that these proposals will give the IAEE a fresh momentum and that you, as members, will benefit accordingly in a range of ways.

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Editor's Note

OPEC's price stabilization actions in both 1986 and 1999 have earned the organization considerable prestige as well as the right to a significant voice and useful lever in the future conduct of global economic policy, says Paul Tempest. However, OPEC's former expectation of dominating the oil price may be badly flawed in the longer term. He looks at the key strengths OPEC and how they might be developed.

Peter Fusaro and Jeremy Wilcox look at the evolution of the electronic energy industry and explore the market drivers for the changes taking place in energy trading. They review the history of energy trading and suggest that the technological drivers of electronic trading and the Internet will funda-

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

The IAEE 23rd Annual Conference in Sydney in June proved to be another very successful conference with over 200 participants from 30 countries attending. It was lively, well attended, profitable and the quality of papers and debate was high. Its location in one of the most beautiful cities of the world only helped to put the icing on the cake. Many of the international participants, having made long trips to reach Sydney, used it as an opportunity to travel in Australasia. Throughout the conference the common message was that the energy world is in the midst of fundamental change. That change is widespread and deep rooted - in terms of markets and prices, industrial structures, technology, deregulation and energy and environmental policies. It was widely agreed that more exciting things are happening today in the world of energy than at any time in at least the last twenty years. We were most appreciative for the support of the twenty sponsors of the conference and particularly for the untiring work of Tony Owen in his role as conference chair.

I would also like to remind you of the two forthcoming regional conferences. First on 31 August/1 September the Norwegian Association for Energy Economics, in association with the Foundation for Research in Economics and Business Administration will be hosting a conference entitled "Towards an Integrated European Energy Market" in Bergen, Norway. And secondly, the 21st Annual North American Conference of the USAEE/IAEE will take place in Philadelphia, PA on September 24-7. The conference title is "Transforming Energy". We will look forward to seeing you at these conferences.

Peter Davies

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

mentally change the structure of energy markets and predict that the next wave of electronic energy trading will be in the retail markets.

Government should play a key role in the management of the energy sector and particularly as it relates to the environment, so says Kim Yeadon, Minister for Energy of New South Wales, Australia. He says one role of government is to identify areas in the economy where markets can be useful and then implement policies that ensure a competitive market. The "invisible hand" is not enough. The "fleshy hand" of government is needed to guide the development and operation of markets.

An executive summary of the Center for Strategic and International Studies' Strategic Energy Initiative assesses international energy supply and demand relationships likely to prevail up to 2020, points out the foreign policy contradictions and offers policy considerations.

Keiichi Yokobori, Masao Takagi and Rong-hwa Wu examine the costs and benefits of expanding oil stocks for various groupings of APEC economies, noting that joint stockpiling by APEC oil importers would achieve economies of scale and improve the efficiencies of stock management. They suggest an expansion of 30 days of net imports as a first step.

Thomas Ahlbrandt and Gene Whitney report on the new U.S. Geological Survey of the technically recoverable undiscovered oil and gas resources of the world. Estimates of undiscovered oil are up considerably from earlier assessments and regional distribution differs considerably from previous estimates. Estimates of undiscovered natural gas resources are smaller than pervious estimates.

Edmilson Moutinho dos Santos examines the outlook for the Brazilian petroleum and natural gas industry over the next twenty years as seen through the eyes of a survey taken of the Oil Forum of the University of São Paulo. He concludes that the industry will continue being the nation's largest business and will be able to attract new investment. He also notes a diminishing of nationalistic feelings toward the industry.

DLW

Future IAEE Events

September 24-27, 2000	21st Annual USAEE/IAEE North American Conference Philadelphia, PA, USA *Wyndham Franklin Plaza Hotel*
April 25-28, 2001	22nd IAEE International Conference Houston, TX, USA *Omni Houston Hotel*
June 26-29, 2002	25th IAEE International Conference Aberdeen, Scotland *Aberdeen Exhibition and Conference Centre*
October 6-8, 2002	22nd USAEE/IAEE North American Conference Vancouver, BC, Canada *Sheraton Wall Centre Hotel*

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

Transforming Energy

21st USAEE/IAEE Annual North American Conference – September 24-27, 2000
Philadelphia, Pennsylvania, USA – Wyndham Franklin Plaza Hotel

If you're concerned about the future of the energy industry and profession, this is one meeting you surely don't want to miss. The 21st USAEE/IAEE Annual North American Conference will detail current developments within the energy field so that you come away with a better sense of energy supply, demand and price. Five plenary sessions will be followed by concurrent sessions designed to focus attention on major sub-themes. Industry participants, bringing sharp focus to the emerging analytical challenges the industry faces, will lead these sessions. Ample time has been reserved for more in-depth discussion of the papers and their implications. Key sessions and themes of the conference are as follows:

New Vehicle Technologies and the Energy System: Sea Change or Pond Ripples?
Evolving Electricity Markets: From Ratebase to Revenue – The Roles of Technology Investment
Power, Fuels and E-Commerce: Maximizing Opportunities as Markets Converge
Paper Markets: Expanding their Scope and Impact on Energy Markets
Charting the Path: Forces and Forecasts

Economic upheaval, globalization, privatization and regulatory reform are having significant impacts on energy markets throughout the world. All of the major energy industries are restructuring through mergers, acquisitions, unbundling and rebundling of energy and other services. This conference will provide a forum for discussion of the constantly changing structure of the energy industries, with insights into the causes and likely outcomes of the restructuring efforts that are now underway.

At this time, confirmed speakers include the following:

William Babcock, Hagler Bailly
Amory Lovins, Rocky Mountain Institute
Carol. Butler, National Clean Cities
David Marquardt, Enron Energy Information Solutions
Peter A. Davies, BP Amoco, plc.
Pat O'Loughlin, DP&L
Claude C. Gravatt, Jr., Department of Commerce
David Rodgers, US Department of Energy
John B. Heywood, MIT
Edward Tirello, Deutsche Banc Alex Brown
Blake Johnson, Stanford University
John Wise, Mobil Research and Development Corp.
Janet Kremer, US Environmental Protection Agency
Louise M. Burke, New York Mercantile Exchange
Ken Malloy, Center for the Advancement of Energy Markets
Michael A. Crew, Rutgers University
Roger Naill, AES Corporation
Ron Erd, Southern Energy
Bruce Radford, Public Utilities Reports, Inc.
Jamie Heller, PHB Hagler Bailly
Fereidoon P. Sioshansi, Menlo Energy Economics
James T. Jensen, Jensen Associates, Inc.
Debbie Wernet, Coral Energy
David Knapp, International Energy Agency
David Buckner, Southern Company Services
James V. Mahoney, PG&E Generating
Thomas R. Casten, Trigen Corporation
Senator Frank H. Murkowski
Lawrence E. DeSimone, PPL EnergyPlus, LLC
Richard P. O'Neill, Federal Energy Regulatory Commission
Stephen Halliday, Wood Mackenzie
Christopher Ross, Arthur D. Little
Youssef Ibrahim, BP Amoco, plc.
Scott Ungerer, EnergTech Capital Partners
Vincent Kaminski, Enron Corp.
Kurt E. Yeager, Electric Power Research Institute

The final session of the conference may become a standard for the new millennium. Peter Davies, President of the International Association of Energy Economists and Chief Economist of BP Amoco Plc., will host a plenary session on "**Charting the Path: Forces and Forecasts**." Dr. Davies has invited experts from industry and academia to discuss what the new energy market may look like a decade from now, and provide their insight into what are expected to be the key drivers in the transformation. This session is expected to be particularly insightful as energy markets stand on the cusp of a technological revolution.

In addition, 25 concurrent sessions are planned to address timely topics that affect all of us specializing in the field of energy economics. Sessions include:

Fuels and Vehicles: Driving the System
The Road to Alternative Fuel Vehicles
Retail Competition – Delivering Value to Consumers
International Developments Mexico/South America
Electric Markets: Restructuring Continues to Evolve
International Developments: Japan, China & Asia
Electric Markets: Wholesale and Retail Market Pricing
Crude Oil: Evolving Market Behavior
Natural Gas Markets: Transportation
International Developments: Middle East & Africa
Electric Markets: Market Power
Natural Gas Markets: Supply
Environmental Challenges
International Developments: European Markets
Electric Markets: Transmission & Bulk Power Systems
Global Warming
E-Commerce and the New Economy
Energy and Economic Development

The 21st USAEE/IAEE Annual North American Conference provides a unique opportunity for leading experts from business, government, universities, and research institutions to discuss and debate the future of energy markets in this era of commodization, decentralization, and internationalization. The meeting will emphasize the applicability of the most recent, cutting-edge analysis for helping private and public organizations frame decisions and choose appropriate strategies.

Philadelphia, PA is a wonderful and scenic/tourist place to meet. Single nights at the Wyndham Hotel are $150.00 (contact the Wyndham Hotel at 215-448-2000, to make your reservations – ask for the USAEE/IAEE North American meeting room block). Conference registration fees are $500.00 for USAEE/IAEE members and $600.00 for non-members.

For additional information on this meeting visit www.usaee.org/conferences/index.asp or return the tear-off below for program materials to be sent direct to your attention.

Transforming Energy

21st Annual North American Conference of the USAEE/IAEE

Please send me further information on the 21st USAEE/IAEE North American Conference.

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A Future for OPEC

*By Paul Tempest**

Summary and Contents

Fortified by relief and exuberance at the return of the market to $20-30 oil, there has been much talk within OPEC of further tightening of its member production quotas. How far can OPEC go? How does OPEC view the wider global macro-economic issues and prospects? To what extent do the current condition and prospects of the global oil market present new risks and new opportunities for the member-countries of OPEC and other leading oil producing countries? These questions lead to a much broader issue–whether OPEC can play in future years a much expanded role as a strong stabilising force in the global economy.

This paper looks at OPEC's prospects in the light of its own actions since its foundation in 1960 and in the light of recent developments in the global economy and markets. The events of the last forty years should give some clear pointers for future action. OPEC's standing is again high. The need of the industry–as well as the need of the global markets and the global economy–for OPEC has again been amply demonstrated over the past year.

The Global Need for OPEC

In 1999, the oil and gas industries were unable to resolve on their own the structural damage and policy dilemmas of a steeply falling oil price. Even the largest companies were faced with the possibility of dismemberment or forced acquisition. The oil price collapse threatened not merely the curtailment of new energy investment world-wide but also a disruptive check to global economic growth.

OPEC's price stabilisation actions in both 1986 and 1999 have, therefore, earned the organisation considerable prestige, as well as a right to a significant voice and useful lever in the future conduct of global economic policy. A closer OPEC involvement in natural gas development and trade, and a strengthened role in market management, together with a jettisoning of the sterile and exaggerated consumer-producer confrontations of the past would seem to be sound ways forward. There are other options under discussion.

A Difficult Path Ahead

OPEC's enhanced position comes at the right time. The latest global and regional environmental, commercial and trading proposals emanating from the United States, West Europe and Japan appear to inflict a heavy environmental and payments burden on many countries of the developing world and on the other smaller OECD economies. For the OPEC countries, these latest proposals have even more severe impacts. They seem to imply a damaging distortion of the terms of trade as well as further isolation from the global economic mainstream and, by implication, deteriorating global leverage.

In the face of these developments, there is again a need for a wider understanding of the issues and for broad agreement on how to secure an acceptable and effective compromise. Policy priorities need to be established to prevent, for example, the exclusion of many countries from the World Trade Organisation, severe distortion in tropical agricultural exports, or the prevention of the further transfer of the most polluting heavy industries from the industrialised to the developing world. Strong leadership will be needed. OPEC may once again be called upon to play a valuable macro-economic role in this process.

OPEC Leadership

The OPEC countries are still the key custodians of the global petroleum resource, the key mineral resource of the global economy, at least for the next few decades and probably for much longer. OPEC as an organisation has also had wide experience over the last forty years and is an adept economic and commercial operator with considerable political understanding.

The main lesson of OPEC's early years was that OPEC leadership provided inspiration and support for the entire developing world. Here was a genuinely global institution comprising key country-members from the Middle East, North and West Africa, Latin America and South-East Asia which was capable of standing up to the super-power governments and the formidable weight of the major multinational corporations and financial institutions.

OPEC retains today its wide undiluted geographical distribution and its multi-cultural character. It deserves to command the respect of the very many countries it is supplying with oil and natural gas, and, indeed, the esteem of all the many players in the global energy markets.

Past Successes and Consequences

OPEC shifted rapidly from the strategies of price control (P) to those of Quantity or Volume (Q). At the outset, reliance on direct action on the posted price to increase tax revenue increased expectations of steadily increasing OPEC government revenue which proved difficult to sustain. In addition, OPEC pricing became a target of consumer countries free trade and anti-cartel legislation.

In October 1973, a partial oil delivery embargo on the United States and various European countries, together with further production constraints and widespread consumer panic, helped to drive oil prices up very sharply. In 1979, the impact of the revolution in Iran had a similar effect on consumer confidence, resulting in another sharp price rise.

The ensuing wave of global inflation and recession caused severe debt problems in the developing world. The OPEC producers were also quickly faced with sharp declines in oil and gas revenue while at the same time their enhanced appetite for imports, particularly arms, and for infrastructure development showed little sign of abatement. Accumulating debt became the central economic management problem throughout the developing world. As soon as the cushion of financial reserves had been exhausted in each of the OPEC states, they also found themselves grappling in the eighties with increasingly acute budgetary and debt constraints. The combination of lower market share and lower prices gave little hope of any alleviation.

The Consequences of Further Confrontation

If the OPEC member states were to decide today that the

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* Paul Tempest is President PTA London and Vice-President BIEE, London. He is also a past President of the Association. This is an updated version of a paper he delivered at the CERI *Canada 2000 World Oil Conference*, January 31 in Calgary, Canada.

only remedy for their current financial problems lies in another bout of extreme outright confrontation on price whether directly or by means of massive cuts in oil production, they would run much greater risks than in the confrontations of the seventies. The market response would again probably be rapid and savage and might prove ungovernable if a domino effect caused the difficulties to spread from state to state.

The main problem today in the OPEC countries is that most of their governments have been too preoccupied with "protecting the golden goose"–maximising oil and gas revenue in the short-term to resolve their acute budgetary and debt problems. They have lost sight of the broader long-term benefits and political dividends of improved economic and social management. They have also become more isolated from world markets and the free flow of trade and capital. In these circumstances, they need to re-examine the benefits of opening up to much wider co-operation for new investment. They need to be leaders in the rapid expansion in global petroleum production in which, in cost and resource terms, the OPEC states deserve to have by far the largest share.

OPEC is Moving in the Right Direction

What then is the downside risk of an OPEC/Consumer confrontation, of another global economic slowdown, and consequently of another political, economic and social firestorm in the OPEC states ?

I think the risks are small because moderate and sensible policies have already been seen to prevail and to bring more sound solutions of long-standing durability. Moreover, in addition to the self-correcting character of all free, open markets, there are now effective market safety-nets in place. On the producer side, OPEC has demonstrated both its determination to rescue the market from low-prices and its ability to cool steeply rising demand by expanding production. On the consumer side, the United States provides a model of how planned sales from the Strategic Petroleum Reserve or other government or commercial stocks can be used to moderate excessive upward surges in price.

Further Globalisation is Likely to Strengthen OPEC

Over recent years, the OPEC member countries have shown only limited enthusiasm for the rapid globalisation of world markets. The oil market has moved a long way from the secret long-term contracts at fixed prices agreed essentially between each producer government and a very limited number of rich and market dominant multinationals whose credit and financial reserves were beyond all question. Today, there are very many players in the market. Arbitrage works easily and automatically through the market. Margins have been squeezed. Inefficient operators have been eliminated. Supply has become much more regionalised. Even the three new super-majors now tread cautiously.

If the market continues to expand, there will be ample demand for oil and gas from OPEC and that demand will be largely free of the political and strategic intervention which came with it in the past.

Above all, the widening of the oil market makes the market more not less robust and that is likely to work in favour of OPEC, particularly in the long-term as the OPEC economies open up much more widely to international capital and trade.

Keeping up with the New Technology

The globalisation of oil, gas, commodity, capital and other financial markets has brought the disciplines of the global market to bear on even the most isolated of oil and gas producers. Their need to keep up with the ever-advancing new technology of petroleum exploration and production can no longer be pushed to one side by entrenched industry conservatism or by ossified bureaucracy or by misguided 'command' direction by the government. Access to international finance is also becoming essential in all high-cost marginal areas. Even the high-reserve producer countries of the Gulf are conscious of the risk of lagging behind in the race for new technology and they are all having difficulty in mobilising adequate marginal finance.

It would be foolish to delay such high-technology investment. While the short-term future of conventional oil and gas production is very bright, the longer-term prospects deserve careful evaluation.

Energy Long-Term Fundamentals

Above all, there is now an increasingly wide consensus that the development of heavy crudes, tar-sands and oil shales will enhance and prolong oil production just at the same time as gas to liquids, coal-bed methane and other new gas technology will give a major stimulus to gas production. If OPEC were to deter inward investment, much of this new petroleum development activity may be diverted outside the current OPEC membership.

OPEC's former expectations of once again dominating the oil market and again becoming the most significant factor in determining the oil-price may, therefore, be badly flawed in the longer term. OPEC expectations were based on assumptions of depleting and declining global supplies of petroleum and ever-rising demand. These supply assumptions are now very widely challenged. Indeed recent studies of long-term prospects commissioned by the International Agencies point to a peaking of global oil production in about 2060 at about double current levels and a peaking of global natural gas production somewhat later at about five times current levels. Some may argue that this level of increase is exaggerated, but very few now believe that, for a very long time, despite environmental pressures, overall petroleum production is likely to stagnate or decline. Even in the short term, the industry is working on expectations of a 2% p.a. increase in global oil demand and even higher rates for natural gas.

China and the Hydrogen Economy

Over the next twenty to fifty years, we will witness the arrival of much more efficient hydrogen fuels and the mass production of vehicles and power modules based on fuel cells and other chemical engines, requiring much less petroleum and, eventually, none at all. China, given its imminent explosion of demand for private sector vehicles of all kinds and also its pressing need to alleviate urban pollution and rural poverty while minimising rising oil import dependence, is likely to provide the major initial stimulus and may quickly capture the manufacturing leadership role in these new technologies as well as finding a new source of economic and trading strength in the form of vehicle and chemical engines exports world-wide. India may not be far behind.

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A Future for OPEC *(continued from page 5)*

So, however the oil supply balance might now be swinging markedly in favour of OPEC in the short-term, this does not mean that OPEC can expect to distort the balance to its own long-term economic advantage. If OPEC were simply to pursue its traditional confrontational role in the global energy markets, its prospects would appear to be very bleak indeed.

This probable long-term weakening of OPEC leverage and its inability to influence all or particular sectors of the petroleum market may prompt the organisation to review what it has learnt from its operations and experience over the first four decades of its existence and to identify its unique strengths.

U.S.–Saudi Symbiosis of Long-Term Interest

It is very difficult to envisage any change to the overall direction of the oil market. On the producer side, Saudi Arabia, holding one quarter of global proven oil reserves is the obvious counterpart to the United States, which accounts for one quarter of global oil consumption. A symbiosis of interest between Saudi Arabia and the United States–both principally motivated by a common concern for economic and political stability–is likely to prevail.

Setting the Market Parameters

These factors seem to translate into a signal that anything below $15 today spells danger, and that any price approaching the $10 level requires action.

A similar parameter can be constructed if prices shoot up much beyond $30. Here, the interest of the United States is in avoiding major global inflation and, as in the 1980s, a slowdown in global economic activity. Any serious disruption in the supply of internationally traded oil in the Gulf, as in 1986-88 and 1990-91 is enough to trigger well co-ordinated consumer responses, both military and political.

The Main Lesson of 1986 and 1999

The main lesson of 1986 and 1999 is, in my view, rather different. It is that OPEC not only learnt to survive in a flood of non-OPEC oil and gas and through tough political and military conflict between members, but that it has gradually won the fundamental argument with the consumers that it is much better for the world economy to have a stable oil price and smooth flow of development than to allow the free market to produce very sharp imbalances and fluctuations in price, particularly if these fluctuations are exaggerated by speculation and consumer panic resulting in long-term damage to the industry and making new long-term investment much more difficult and much more costly. Indeed, OPEC has won world-wide a grudging admiration for its actions in 1986 and 1999, when the international oil industry was brought to its knees by low oil prices and when even the very largest companies found themselves facing up to the prospect of collapse or dismemberment.

OPEC, therefore, has a firm foundation on which it could build a new and highly legitimate role in the global community.

Let us, therefore, look at the key strengths of OPEC and how they might be developed.

Resilient Market Strength

OPEC's market share peaked in the early seventies (see Table 1) at over half global oil production. Thanks to the stimuli given to non-OPEC production by the steep price rises of the seventies, OPEC market share fell back to below one third by the mid-eighties. It is now likely to rise to 37.6% in the year 2000.

The above figures include all oil produced and consumed at home as well as for export. If we look solely at the export figures, we immediately see a very different picture : OPEC still accounts for some two-thirds of global exports of crude and about one-third of global exports of product. In the international oil trade, OPEC, as an aggregate of its members and provided it can achieve unity in its purpose and co-ordinated action, is still very powerful indeed.

Table 1
Global Oil Market Share

		OPEC*	NON-OPEC
At Ten Year Intervals			
	1960*	39.4%	60.6%
	1970	49.3%	50.7%
	1980	43.7%	56.3%
	1990	37.8%	62.2%
	2000**	37.6%	62.4%
The Oil Price Discontinuity Years			
UP	1973	53.1%	46.9%
UP	1979	47.9%	52.1%
DOWN	1986	32.4%	67.6%
DOWN	1999**	37.2%	62.8%

*OPEC members as at 1.1.2000

** Estimate

OPEC Cohesion and Leadership

Throughout the last forty years, OPEC has developed quite remarkable cohesion and its survival has often demonstrated mature and intelligent leadership.

It has survived two major price collapses and a persistent decline in its market share. Even during the eight years of the Iran-Iraq war (1980-1988), Iranian and Iraqi delegates sat shoulder-to-shoulder in OPEC meetings. During the period of the Iraqi occupation of Kuwait (1990-91), both countries continued to be represented at OPEC. In both periods, cohesion was maintained by sensible compromise to the lasting credit of OPEC diplomacy and astute strategic planning.

Effective Decision-making

OPEC decision-making is more straightforward than it might appear. The organisation was founded in Iraq, thanks mainly to the co-operation and inspiration of two individuals, Perez Alfonso of Venezuela and Abdulla Tariki of Saudi Arabia. The other two founding member-countries were Iran and Kuwait. To this day, although OPEC is scrupulous in allowing all members to have their say and, wherever possible, to proceed by unanimous consensus, any controversial OPEC decision begins–in effect–with the views of these five founding members. The leadership of the organisation still turns on Saudi Arabia's ability to secure the support of, first and foremost, Iran. Venezuela has also repeatedly made a major and mature contribution to OPEC thinking.

Continuity of Membership and Direction

There have not been many changes in OPEC membership.

While a total of eight other petroleum exporting countries later joined the organisation, Ecuador and Gabon dropped out, leaving a total of eleven countries at present– Algeria, Indonesia, Libya, Nigeria, Qatar, and UAE plus the five founding members. If Oman can be persuaded to join, the Arab Gulf states will move from a five-country, 45 percent share of the membership to a six-country and 50 percent of the membership. This share would, of course, be diluted if OPEC ever persuaded other major oil exporters such as Colombia, Mexico, Norway or Russia to join. However, this does not seem to be very likely at present.

In terms of the structure of the present organisation, Mexico, Norway, Russia and Colombia are likely to continue as sympathetic onlookers. Further defections appear unlikely.

A Valuable Bridge

Another remarkable success of OPEC has been to weld political extremes–extreme right and extreme left–into effective co-operation.

OPEC has also always provided a useful channel of communication to some of the most inaccessible and difficult regimes in the world: Algeria, Nigeria, Venezuela and Indonesia when they were in the midst of acute turmoil at home; Iran, Iraq and Libya grappling with United States and UN sanctions, Kuwait under occupation. For most of the teams of oilmen, dealers, diplomats, arms salesmen and others in the lobbies of the hotels around an OPEC meeting, what OPEC decides or does not decide is of relatively little importance. These hangers-on are there to have discreet and easy access to Ministers and senior officials, whose accessibility at home is severely constrained. Similarly, the company traders are there in strength as this is where many of the deals with the national oil companies are done and the contractual arrangements agreed.

The Public Face of OPEC has Changed

As outlined above, throughout the last forty years OPEC has been widely regarded as an umbrella or screen to give added legitimacy to the market intervention of its two leaders, Saudi Arabia and Iran. The other members were happy to go along with this, so long as each could see the demonstrable benefits of concerted action, and while the real economic pain of limiting output and thereby foregoing immediate revenue fell principally on the two leading countries. Some of the internal squabbles of the smaller members faced with mainly hostile consumer response were re-ignited in1999 with the new OPEC calls for cuts in quotas and overall production constraint.

Thanks mainly to the inspiration and leadership of former Secretary-General Dr. Subroto of Indonesia, OPEC through the 1980s and 1990s largely succeeded in shedding its confrontational image. It now presents itself as an oil producer and trade association willing always to engage in constructive dialogue with the consumer and as fully aware of the need to preserve the integrity of global markets and the free flow of goods and services across international boundaries. It reminds the press and others that its original Constitution and mandate emphasise the need for the international companies to achieve an adequate rate of return on capital employed, and for consumer governments to enjoy stable prices and security of supply.

Currently, OPEC is hunting desperately for the right arguments to accommodate well-orchestrated challenges from the World Trade Organisation and others regarding its market intervention intentions.

OPEC should be able to come up with some sound responses. But it could go much further in this direction if the key member-countries could see the long-term benefit of more co-operative policies. Among such options, natural gas may provide a route to a wider global role for OPEC.

Natural Gas Exports - A New Role for OPEC

OPEC is the Organisation of Petroleum Exporting Countries; petroleum embraces crude oil and condensates and also natural gas and natural gas liquids. So far, OPEC has focussed on the co-ordination of oil exports. It has devoted few resources or initiatives towards the natural gas sector and its leading exporters.

The rapid evolution of major trans-continental gas pipelines poses a question as to how the major gas exporters might wish to strengthen their negotiating positions. This presents some difficulties for OPEC. It is hard to see how Canada and the gas exporters of Latin America could be persuaded at present to join a global organisation located in Vienna and directed mainly from Riyadh and Tehran. Equally, the issues of liquefied natural gas supply to Japan, Korea and other markets in Southeast Asia would suggest some form of regional leadership by Australia.

This leaves the Europe-Asia-North Africa gas supply system of the future. This will turn on an inter-linked longitudinal production hub of Siberia, Caspian/Central Asia and the Gulf states, and a latitudinal production axis stretching along North Africa, from Algeria through Libya and Egypt and on through Saudi Arabia to the Gulf states and Iran.

Already, there are the two trans-Mediterranean gas pipeline routes, extensive linkages from Siberia through Eastern Europe to the Western Europe industrial heartland, links across Saudi Arabia, and from Iran to Russia. As these gradually develop into a comprehensive network extending most certainly into China and possibly to the sub-continent, there will be demands for co-ordination from the various gas suppliers. Among OPEC members, Algeria already stands out as a major gas exporter. Nor can the gas export potential of Iran be ignored, given its abundant resources and ability to provide transit facilities for other Gulf gas. Outside OPEC, despite all its current difficulties, Russia is, and will remain, the obvious leader. Norway also is likely to be very interested in keeping abreast of these developments. Iraq, as in its potential to swamp the oil market, is a wild card in Euro-Asian gas supply.

If indeed Kazakhstan, Uzbekistan, Azerbaijan, and other central Asian states follow up on their first tentative overtures to OPEC, we may well see OPEC evolving into a completely new direction and with a significant natural gas component. The consequent strengthening of Iran's position within the organisation might, in the long run and despite a distinct shift in the regional geopolitics of the Gulf, provide a welcome relief to Saudi Arabia. Any such development would likely enhance the durability of OPEC.

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A Future for OPEC *(continued from page 7)*

Much Wider Global Producer Cooperation

Oil has been the prime fuel of global economic growth through the 20th Century. Both oil and natural gas are likely to be even more significant in terms of volume and will be slow to cede market share of the total global energy mix at least for the first half of the 21st century. As international trade in both oil and gas continues to expand vigorously, there will be a need for much closer co-operation and co-ordination at the technical and market regulatory level.

Sooner or later questions of reserve quality, volume, technical specification, storage and transportation criteria, refinery and product specifications, etc. will call for something more than informal inter-company exchanges. The global energy markets will expand strongly and need firm infrastructure. There will be new international agencies. OPEC is now well-placed to widen its activities and to develop its current technological expertise. One option might be to launch a global Petroleum Institution or Agency with United Nations recognition, serving all OPEC and non-OPEC producers. Another might be to play a much stronger role as an accredited agency of the World Petroleum Permanent Council (59 national committees, including virtually all major producers and all major consumers) or to use the expertise of the International Energy Agency based in Paris in building a stronger economic and technological OPEC expertise and management capability. Another option is a redefinition of the objectives of the OPEC Fund.

Yet another option which is in line with the world-wide trend to privatise state industries would be to align OPEC with private sector commercial practice. There may be other mechanisms to draw the leading multinationals into a much closer relationship with OPEC. An OPEC/ Petroleum Industry Council might be used very usefully in market management and in establishing new technical procedures and standards.

Conclusions

OPEC today still runs the risk of being trapped in the seventies-style Price (P) and Quantity (Q) confrontational politics which proved so sterile and, in the long-run, ineffective. On the other hand, the friendly and helpful face of OPEC as developed in the eighties and nineties and the support of the bulk of the global oil industry could lead to a broadening of OPEC coverage for both oil and natural gas producers within and outside current OPEC membership and for a widening role of technological co-operation and co-ordination of the global energy markets.

IAEE Awards Four Scholarships

The IAEE Scholarship Committee has awarded four $2500 scholarships for the year 2000. Earning these awards were Fabian Bachtiar, Alberto Elizade Baltierra, Ausra Pazeraite, and Wei-Hun Siew.

Fabian Bachtiar, who comes from Indonesia, is a senior at the University of Oklahoma, majoring in Energy Management. He has worked as an intern from both ARCO and Devon Energy and is currently producing a major paper on Phillips Petroleum for his class project.

Alberto Baltierra is a second year doctoral student at the University of Paris IX-Dauphine and IFP School. His work there concerns the articulation of Mexico into the competitive dynamics of the North American natural gas market. His earlier studies were at the National Autonomous University of Mexico (UNAM).

Ausra Pazeraite is pursuing a Ph.D. in Business and Management at Vytautas Magnus University in Lithuania while at the same time working for the Lithuanian Energy Institute. As part of her work she has participated in the development of a National Energy Action Plan and Strategy for Lithuania. Though in her early twenties, she has written solely or with colleagues nine papers and made presentations to the World Energy Council Regional Forum.

Wei-Hun Siew is a Ph.D. student at the Centre for Energy, Petroleum & Mineral Law & Policy in Dundee, Scotland. His thesis will investigate the use of modern finance and economic theory in assessing risk in an oil company's investment decision-making process. He graduated from the University of Manchester with first class honours in Finance.

The Scholarship Committee was composed of Jean-Philippe Ceuille, Michelle Foss and Peter Davies with the latter as chair. This is the second year the IAEE has awarded scholarships. In both years, $10,000 was awarded.

Italian Association of Energy Economists

European Commission
Directorate General Energy

2nd International Conference On

Energy Efficiency in Household Appliances and Lighting

27-29 September 2000 • Grand Hotel Vesuvio • Naples, Italy

The Conference will be organised - in the framework of the SAVE Programme of the European Commission - by AIEE – Italian Association of Energy Economists, ISIS – Institute for Systems Integration Studies, Van Holsteijn En Kemna BV and ISR - University of Coimbra. This three-day conference will address the full range of topics related to energy efficiency:

- energy consumption and energy efficiency improvements of domestic appliances and lighting
- energy efficiency policies and measures, labelling, standards, voluntary agreements procurement and DSM in geographically varied situations
- technological innovations and new performing cost effective systems
- contributions and perspectives of energy efficiency in domestic appliances and lighting with regards to sustainable development

This event - which brings together a prominent group of professionals and decision makers from every continent of the world - will provide a unique opportunity to debate about current developments with high-level representatives of key industry, public authorities, international organisations and consumers, so as to collect relevant, up-to-date and practical information in a short period of time.

The Official Opening will be held by the Italian Minister of the Environment, Mr. Edo Ronchi, followed by the Keynote Address by the European Union Presidency. The conference will provide participants with 4 general sessions and 24 parallel sessions with an expert team of 110 distinguished speakers who will provide a forum to discuss and debate technical and commercial advances in the dissemination and penetration of energy efficient household appliances and lighting

Linked to the Conference, a three-day ***ENERGY EFFICIENCY SHOWCASE EXHIBITION*** will allow visitors to gain updated insight on energy efficiency technologies of products, phototypes, multimedia and interactive software tools in household appliances, consumer electronics, lighting and HVAC.

In addition to a highly professional programme, the Conference will be the opportunity for delegates and accompanying persons to enjoy many cultural visits and social events throughout Naples.

The day before the Conference (September 26) an half-day technical tour to Whirpool – one of the leading whitegoods manufacturing factories – near Naples will be organised to provide delegates with an on site presentation of the state-of-art of energy efficiency technologies.

A guided tour to the Museum of Capodimonte – the Neapolitan ancient museum once the residence of the Borboni family - will be organised for all participants and guests on September 27; the following day, a gala dinner on a very charming restaurant facing the lights of Naples across the Bay will be also offered to them. A the end of the conference a private guided tour will organised on September 29 to visit the excavations of Ercolano, the ancient Roman town “Hercolaneum” destroyed by the Vesuvian eruption in 79 A.C., famous for its town planning.

Two informative and enjoyable sightseeing tours through Naples have been planned for accompanying persons during the first two days of the conference. Additional tours to Capri, Ischia, Positano, Amalfi, etc. will be available, too.

For further information or registration details, please contact:

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The Evolution of the Electronic Energy Industry

*By Peter C. Fusaro & Jeremy Wilcox**

Introduction:

Electronic Commerce (e-Commerce) opportunities for energy are being manifested for energy trading, energy procurement, and electronic billing and metering. The energy industry is significantly conducive to the use of Internet applications because of its information intensity, and electronic commerce is transforming energy markets. The mature markets of oil and gas trading as well as the emerging markets for electric power, emissions and weather trading are ripe for trading on electronic platforms. This article is extracted from our report, *Electronic Energy Trading*, and explores the market drivers for the changes taking place in energy trading globally.

Energy trading began after the end of Official Selling Price (OSP) programs by the major oil companies and OPEC nations after the 1973 Oil Embargo and coincided with the development of a spot market for crude oil and petroleum products. In 1978, the changing structure nature of the physical spot market for oil presaged the development of energy futures with the successful launch of the New York Mercantile Exchange (NYMEX) heating oil futures contract which was tied to its physical delivery in New York harbor. Successive oil futures contracts and the development of an active Over-the-Counter (OTC) market for forward oil trading in the early 1980s brought significant structural changes to the international oil industry. In effect, price transparency accelerated both physical and financial trading of crude oil and petroleum products globally. In April 1990, the NYMEX launched the very successful Henry Hub natural gas futures contract, which simultaneously coincided with the development of an active OTC natural gas market.

Electricity trading began with the Nord Pool contract for the Scandinavian markets in 1993. NYMEX, the Chicago Board of Trade (CBOT) and the Minneapolis Grain Exchange (MGE) have since launched eight failing electricity futures contracts. In this case, the OTC market for electricity derivatives in the United States began in late 1993 prior to the futures contract launches which began on March 29, 1996. Clearly, something had changed. What had changed is the structure of energy futures trading. The age of electronic trading coupled with OTC market flexibility have usurped exchange-traded electricity contracts. The exchanges have been slow to react to this phenomenon.

Other critical changes have occurred over the past twenty years, price assessment panels and index trading which failed in the late 1980s are succeeding in the 1990s. A sea change in energy trading is underway. Electronic index construction coupled with screen trading is already changing the industry globally. Electronic broking and trading platforms are emerging that will continue to change the face of energy trading.

Changes underway in energy trading are impacting on this capital intensive and conservative industry. The energy industry is on the brink of dynamic and dramatic fundamental change both in the physical and financial markets around the world. Electronic energy trading is now emerging across the globe in all energy markets. Companies such as Altra Energy Technologies, Houston Street, Swapnet, Bloomberg, RedMeteor.com, PEPEX and the like are leading the way. The futures exchanges are beginning to face this global challenge. The energy business is consolidating, restructuring and concentrating on a larger scale like never before. Margins are razor thin, therefore, volume becomes the only game in town and the need to move more barrels, molecules, or electrons is paramount.

Energy deregulation created the need for newer information systems that could support competitive markets. Deregulation shifts more risks to companies so that more trading and hedging is inevitable. The technological drivers of electronic trading and the Internet will fundamentally change the structure of energy markets that will inevitability enhance market liquidity across the energy complex and around the world. The Internet has become the tool required for the next generation of energy trading which is faster, higher volume, and needs IT to be successful. It is definitely a new world affecting market share, procurement patterns, and price volatility. The radical restructuring of the energy industries in oil, gas and power across the world is accelerating and simultaneously evolving with increased Internet usage by the industry.

Business-to-business e-commerce is already becoming a major part of the global energy trading markets and has been estimated by Forrester Research to grow to $266 billion by 2004 including online exchanges, auctions and retail aggregators. Electronic trading also can reduce transaction costs through greater economies of scale, an advantage over both futures exchanges and brokers. Electronic energy trading will also be integrated into a robust price risk and transaction management system so that real time trading operations can be integrated into a company's front to back office.

The next wave of electronic energy will be in the retail markets as customer choice initiatives take hold through further deregulation. The ability to choose energy suppliers including energy measurement and bill payment through the Internet is just starting to take hold and is being offered by some utilities. The future will also integrate not only energy bills but also telecommunication and water bills into one Internet-based bill. Secure payment will be made by credit card over the Internet. Other Internet applications will be brought forward in the form of aggregators, which is key to unlocking the power of retail markets because of diffusion of buyers and sellers. Fragmented markets create inefficiencies. Robust electronic exchanges are the next step in the transformation of the energy industry toward an e-commerce base.

One of the problems in the past for electronic trading systems was that they had been dependent on costly, dedicated private networks and computer hardware, which added overheads for users making them less competitive against conventional telephone trading. Now though it is possible to harness the power of the Internet for business applications and offer global business-to-business e-commerce solutions for traders with no up front cost. All the user needs is an access to the Internet.

The variety and scale of the electronic trading platforms

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* Peter C. Fusaro is President of Global Change Associates Inc. and Jeremy Wilcox is Managing Director, Global Change Associates (Europe) Ltd. This article is extracted from *Electronic Energy Trading (2000)*, a Global Change Associates Inc. special report (www.global-change.com) and *Energy E-Commerce,* an occasional paper from ICEED.

would seem to indicate that there will be a large ramping up of many competitive systems, a consolidation period, and then the emergence of clear winners. Since many new and unknown competitors are in the offing, it is helpful to look at the existing systems of today and evaluate their road to success or failure. This discussion will include electronic exchanges, OTC brokers, and the development of e-trade capability by traditional floor exchanges such as NYMEX, IPE and SIMEX (Singapore International Monetary Exchange) now known as the Singapore Exchange.

However, the key financial market change was the shift of the Deutschmark from the London's LIFFE (London International Financial Futures Exchange) to Eurex in a manner of months when Eurex went electronic in early 1999. LIFFE eventually went electronic but lost its momentum. This incident was a wake up call for the futures industry that electronic trading was real and an accelerating threat to the traditional monopoly of floor-based futures trading.

The second electronic competitive threat is proliferation of cheap electronic communication networks (ECNs) that are already threatening both financial and commodity exchanges. Unfortunately, exchange members are slow to adapt since they have an interest in maintaining the status quo and have been reluctant to move aggressively from floor-based to screen-based trading. ECNs match buyers and sellers without a need for voice confirmation. ECNs such as Island and Archipelago have already stolen volume from the New York Stock Exchange.

The question, thus, becomes how will electronic trading transform energy markets not when. Energy brokers are trying to forestall this event by pooling their gas and electricity data through 'broker-assisted' networks that will fall by the wayside in the wake of rapid technological change and a migration to the Internet. System openness will cause these alliances and closed systems to dissipate. Their clients are not technologically phobic and will gravitate to new trading solutions based on ease of access, cost and reliability of the emerging system platforms.

Energy markets are conservative in nature and thrive on security of supply. The avoidance of risk would seem to be a curious place to foster the electronic future, but the added impetus of energy deregulation as a global phenomena is bringing the technology solution to the industry quite rapidly as a consequence of more market risk. Liberalization is the process of introducing competition and brings with it radical changes to the structure of the industry. Traditional business practices tend to disappear, as new competitive forces are unleashed. Moreover, new competitors such as Oracle, Microsoft, AT&T, British Telecommunications and IBM already have made inroads into this industry for many years.

The e-Business model for the electric utility business is just now evolving but the core concept is the ability to allow transactions for the business either in wholesale energy trading or in retail services for customers. Utilities are starting to recognize that the technology imperative becomes a key market driver for not only reducing customer service costs, but also a means to retain and attract customers. It improves the quality of the customer service. Incidentally, Internet back office applications like billing and customer care are becoming much more central to the energy business.

Today, some of the key barriers to electronic electric and gas bills are the lack of industry standards since the marketplace is still developing as well as the need to create an "electronic bond" with customers. It extends the reach of the utility and should improve efficiencies in utility operations. It is also bringing with it new competitors who have a different view of the industry and use different business models. Some of these efforts will fail, as a shake out in the industry is inevitable. But it is interesting that Internet information parallels energy flow and the liberalization effort now underway. It is another change agent that fundamentally changes the utility business. Further penetration of personal computers for residential as well as commercial and industrial customers will make aggregation efforts easier to become successful. In the future, the Internet will become the standard for all utility transactions, and the value of this transaction-oriented data will become more valuable.

The next generation of e-commerce is beginning to emerge with the use of more seamless technology. Electronic Data Interchange (EDI) and other standards are beginning to emerge which are better encrypted and more secure. But the reality is that today, the energy electronic commerce solution is focused on the building of an infrastructure rather than exploiting more powerful network applications. In a sense, they are first and second generation technologies. Once the networks are more established and robust, even more competitive solutions and applications will emerge. Business to business e-commerce in energy will be forced to move to real time with next hour gas markets following electric power markets. Aggregators will provide more bundled services. And a true multicommodity warehouse of oil, gas, coal, power, emissions, weather and bandwidth will be available in the trading equation as a one-stop shop.

While established energy commodity exchanges fear erosion of their market franchise due to new electronic competitors, fragmentation of the market will be the immediate impact before the market consolidation period occurs. Competition will force the existing exchanges to alter their traditional way of doing business but probably can not move them fast enough to meet the new competitive floorless challenge.

In a world without walls, global exchanges will be the shapers of the rules, standards and technologies. New electronic exchanges were not envisioned under the regulatory structures of open outcry trading floors. While traditional risks of mishandling of accounts and floor trading market manipulation will recede, new types of regulatory oversight will be needed. Record keeping requirements, for pit trading will become obsolete, but electronic audit trails will need to be maintained.

Rapid growth of electronic trading is forcing fundamental, structural changes in the energy markets and in the energy industry. The model of global energy trading is being irrevocably changed. Better transaction data, more price transparency, reduced trading fees, and access to better information will create more liquidity but lower margins. Volume will surge, and newer players will be engaging in the business of energy risk management and energy trading.

It is predicted that the spread of the Internet and electronic commerce will give rise to price destruction on manufactured goods and fundamentally change the manufacturing industry. E-commerce is already becoming the main

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The Evolution of the Electronic Energy Industry

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distribution channel for the energy industry. The change rate is accelerating as energy trading takes hold throughout the industry. It is only the beginning of this fundamental change process.

While today Internet technologies are still prone to problems regarding reliability, speed and performance, the transformation into a medium that is fast, reliable, and convenient is rapidly emerging. Already hand held wireless devices for cellular phones and notebook computers are under commercial development and will use Wireless Applications Protocol (WAP). This change will bring seamless access to the Internet. The impact on Internet energy trading will be instantaneous access in real time from anywhere in the world. The movement toward broad band technologies with text, voice, video, and graphics will widen applications even more and move past current Internet gridlock. DSL and cable modems will move more data, that is, financial transactions; thus adding the technological capability to enhance market liquidity. Moreover, speech recognition and translation technologies will be more finely developed which will further globalize Internet-based trading. These new speech recognition algorithms will improve the interface with the network creating the virtual global trading floor. Some energy market players are in fact waiting for greater technological developments before they launch their electronic trading platforms. They will use the technologically advanced edge to gain market share.

Electronic energy trading may be a double edge sword. It may lead to more trading liquidity with more individual investors, but it could lead to higher price volatility since active day traders try to exploit tiny price discrepancies in the market. This trend is already in evidence in U.S. stock trading as a "volatility influence" exists. For the energy complex, which are the most volatility commodities ever created, it probably means even more volatility fueled by day traders. This phenomenon is already in evidence and influenced by NYMEX floor traders who trade for their own account on a daily basis.

As established futures markets consolidate and demutualize in response to the new technologically advanced competitors, the role of existing exchanges changes to that of listed companies and their floor operations are fighting survival in the wake of technological change and global financial integration. They must adapt or be superceded with the next generation of technology. These new electronic exchanges are thus perfectly positioned for the emerging markets of electricity, emissions, weather and bandwidth trading since they can be constructed quickly and at minimal costs. Real-time will really be in real-time in the future with 24 hour markets everyday of the year.

Report of the 2000 Annual General Membership Meeting and the Year 1999

President Peter Davies called the meeting to order on June 9 at the Hilton Hotel, Sydney, Australia and introduced Council members present.

Davies went on to report on the results of the Council and strategy meetings held earlier in the week, noting:

- Agreement to commission studies on topics of current interest and using these as the basis of a session at the Aberdeen meeting.
- Agreement on the intent to strengthen the association's Web site by:
  1. Increasing the number of links to other organizations.
  2. Placing *The Energy Journal* content on the site in a manner indicated by best industry practice; the precise manner to be determined in consultation with the editors.
  3. Offering each affiliate a web page using a standard format.
  4. Becoming the center for energy knowledge and information – the site first turned to for energy information.
- Agreement to establish a two member student advisory group to the president; this to be done by the president-elect soliciting recommendations and then naming two students to advise him on student matters during his year as president. The scholarship fund was raised to $20,000 and is to be redirected to paying the expenses of these students to Council and international meetings.
- Agreement to encourage joint relationships/links with other energy groups, and to use the IAEE logo as appropriate to help implement this. The Vice President of Conferences was empowered to manage this.
- Other
  1. Council expressed its desire to have HQ handle the complete logistics of future conferences.
  2. Efforts will be made to develop a target membership-marketing program.

Discussion followed with a suggestion made to include a job market at the international meeting.

Other matters discussed included fees for academics at the meeting, the distribution of meeting content between business and academic, the desirability of having a presidential address at the meeting and the pros and cons of holding meetings at academic locations.

The meeting was adjourned at approximately 6:45 pm.

Subsequent to the meeting, the Executive Director reported the following:

1999 Statement of Income and Expense

Income		Expenses	
Dues	$146,000	Admin. & Office Oprs.	$126,000
Meetings	26,000	Publications	118,000
Publications	99,000	Other	39,000
Interest	32,000	Total	$283,000
Other	28,000		
Total	$331,000	Net Income	$48,000

December 31, 1999 Balance Sheet

Assets		Liabilities & Fund Balance	
Cash & Equivalents	$697,000	Accounts Payable	$2,000
Accounts Receivable	15,000	Deferred Dues & Subscriptions	68,000
Total	$712,000	Total	$70,000
		Fund Balance	642,000
		Total	$712,000

Government, Competitive Energy Markets and the Environment

*By The Honorable Kim Yeadon MP**

Introduction

I would like to begin by highlighting the major issues on the conference agenda:

- Efficiency
- Environment and
- Security of supply.

At first glance these conference themes may look contradictory.

How do we achieve greater efficiency without sacrificing our valuable environmental resources and at the same time ensure a secure, safe and reliable supply?

Resources are limited. However society's demands on those resources are not. Trade offs have to be made.

A key role of government is to make these trade offs or create the environment in which trade offs can effectively be made by producers and consumers in the economy. In recent years the energy sector has been dominated by reform particularly in the electricity sector, which is the focus of my talk today.

These reforms represent a fairly radical departure from the way energy services have traditionally been delivered - certainly in this country. A central feature of these reforms is that most of the important resource allocation, pricing and quality decisions are now being made through market processes, rather than by government. However, while markets work well in delivering some services, they don't always work well enough. Under these circumstances, government can play an important role.

Today I want to talk about the role of the government in the competitive energy sector, not only in ensuring that markets work well, but also in establishing those markets. In particular, I want to focus on the role of government and the management of valuable *environmental* resources in the context of a market.

While government has made considerable progress in managing the economic efficiency of the electricity sector, there is much more to be done in getting producers and consumers to take account of the environmental resources they use–particularly in the area of greenhouse emissions.

The New South Wales (NSW) Government is keen to provide industry with a number of market based options to deal with the greenhouse problem. Waiting only makes the task harder for business.

What is the Overall Role of Government?

In thinking about the role of government in the energy sector, it is perhaps worth starting more generally. At the broadest level, government is expected to reflect the collective views of society through the structure and operation of government policy and law. And in reflecting those views there is an expectation that government will not only ensure that the economic cake is as large as it can be, but ensure that the cake is divided between the community in a fair and equitable manner.

So how have these broad principles been applied to the energy sector and electricity in particular in Australia?

Electricity Reform

In Australia and NSW in particular, the government has developed and implemented a series of competitive electricity market reforms as a way of making the economic cake larger. Competition has encouraged low cost production, and the competitive market has seen those lower costs passed directly on to consumers.

We estimate that since May 1995, when the NSW Government commenced its electricity reforms, NSW electricity customers have saved over $1.3 billion in real terms on their power bills. These savings have been a key driver in the introduction of competition. And it is customer choice that is the engine of competition. If customers don't have the right and ability to be supplied by an alternative producer, then competition won't occur.

The electricity reforms in NSW revolve around the creation of choice to stimulate the operation of a market, which then, through the "invisible hand" results in resource allocations that are apparently optimal in the sense that the fewest resources are used to meet customers' energy demand. NSW Government policy was required to bring this market about. It wasn't going to happen by itself. Thus, one role of government is to explicitly identify areas in the economy where markets can be useful, and then to develop and implement policies that give rise to the operation of a competitive market. But an important question remains, once the market is established, in whatever form, is the "invisible hand" enough, or should there be a "fleshy hand" where government continues to guide the development and operation of markets?

I believe that governments do have a legitimate, ongoing responsibility to ensure that markets continue to deliver the best outcomes for consumers. Energy markets and electricity in particular are immature. In fact the National Electricity Market in Australia has only been operating since December 1998, just 18 months.

It would be surprising if the market rules and regulations worked well from the start with no need for refinement or even a complete rethink in some instances. If such refinements or fundamental changes are ultimately required, is it appropriate for government to leave it up to producers in the market to rearrange the operation of the market by themselves, without any oversight or approval from government?

Absolutely not.

The simple reason is that producers do not have the interests of the consumers nor of the economy at heart. However, governments do have an interest in such outcomes and, therefore, are perhaps best placed, or at least motivated, to design and implement arrangements that achieve the most efficient outcome.

Markets are created by government to achieve certain policy outcomes. They are designed to benefit the entire community.

In the case of electricity in NSW, our government separated the monopoly generator into three competing generators and it has worked hard to develop stronger

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* Kim Yeadon is New South Wales Minister for Energy. This address was given at the opening of the 23rd International Meeting of IAEE, June 7-10 in Sydney, Australia.

Government, and Energy Markets *(continued from page 13)*

interconnection with other States to broaden the boundaries of the market, and in doing so creating a more competitive market.

Another key feature of these reforms was the creation of dedicated bodies to administer the market, the National Electricity Market Management Company–NEMMCO–and the National Electricity Code Administrator–NECA.

NEMMCO was expected to run the market according to the market rules, as enshrined in a National Electricity Code, while NECA was expected to independently monitor whether market participants were following these rules.

The various state governments participating in the National Electricity Market appoint the members of the Boards governing NEMMCO and NECA and in doing so, may, theoretically at least, exercise their power over the market through the Boards.

The purpose of these organisations was to put government at arms length to the development and operation of the National Electricity Market – in effect remove government from making decisions about the way the electricity market works.

There is an important question as to whether this approach is desirable. Let me illustrate by way of example, why I think it is not only desirable, but imperative, that the government continue be involved in the ongoing management of markets, and the electricity market in particular.

One feature of the Australian National Electricity Market is its regional structure. The market operates in a way that establishes a single price that prevails across the market unless there are transmission constraints between the states. When this occurs the price in one state, the one that imports power over the constrained transmission interconnect, rises above the price in the exporting state. This was designed to reflect to producers and consumers the need to invest in new capacity or to cause customers to reduce demand to avoid causing these high prices.

This same concept can be applied at a much more micro level whereby prices could vary in lots of different places across the country, reflecting *local* shortages of transmission capacity.

At first glance, it would appear sensible that if the government has accepted that some form of aggregate regional pricing is an appropriate mechanism to influence the quantity of transmission capacity supplied and demanded, then it should follow that even greater regionalisation of the power system will deliver even greater economic gains.

Indeed, this is the belief of NEMMCO and NECA, the appointed guardians of the market. However, there is one factor that has been missed in this logic. In the process of localising the market, by creating multiple pricing regions, this effectively makes each generator a larger player in a smaller market, thereby effectively reducing the competitiveness of the market.

As we all know, if you reduce competition then you can expect higher prices that reflects nothing more than a producer's desire for more profits. At the time of designing the National Electricity Market rules, the participating governments had before them a detailed consideration of these alternative models. Ultimately, these governments of the day sacrificed the economic purity of pricing transmission capacity at a micro-level for a more competitive generation market, which was the key objective of the reforms.

This trade off made customers better off than under the alternative. It also made the economy better off. And as agents for both, the government had, and still has every right to ensure that this policy is delivered.

NECA has other ideas. It has forcefully attempted to override government policy, and breach its responsibilities under the Code to encourage competition, by seeking to overturn the existing market rules in favor of some theoretical construct which ultimately would undermine the achievement of the objectives of the electricity reforms.

Thus, it is clear that government needs to be vigilant and ensure that its reform aims are realised over time. This is not a surprising conclusion. After all, as I have already pointed out, even in the purest forms of markets the government's "fleshy hand" steers the market on a continuous basis to produce outcomes that benefit consumers.

For the National Electricity Market, this probably means that the governance structures of NEMMCO and NECA need to be changed so that their interests are more strongly aligned with the reform aims of the governments that brought these organisations about.

In this regard, the NSW Government is leading the development of new governance arrangements and is working closely with other States to ensure that more effective arrangements can be put in place to ensure continual improvement in outcomes for customers.

Government and the Environment

I now want to turn my attention to an area of the energy sector that the NSW Government has focused on and the Australian Federal Government has seriously neglected – the environment.

We all acknowledge that the energy sector is a large user of environmental resources, and a major greenhouse emitter. Being the main user of non-renewable environmental goods around the world, the energy sector is a great place to start. It is where we will get most 'bang-for-buck'.

But what needs to be done?

The NSW Government has focused on providing market based solutions such as trading in carbon sequestration. However, the Federal Government has failed to deliver for industry across Australia.

The Federal Minister for the Environment, Senator Robert Hill, has effectively quashed any chance of an emissions trading market developing in this country.

Let me explain.

Recently, Senator Hill said at a recent address to the Pew Center on Global Change in Washington that:

"… the Government is considering the full ramifications of a possible domestic trading scheme. As we have argued for emissions trading internationally to reduce the cost of abatement, there is obvious logic in facilitating such a market-based mechanism within our domestic economy for the same objectives"[1]

I agree. But Senator Hill goes on to say:

"… our government has consistently cautioned that decisions on emissions trading in Australia cannot be made

[1] "Beyond Kyoto – Australia's efforts to combat global warming", A speech to the Pew Center on Global Climate Change, by Senator Robert Hill, Washington, 25 April 2000. www.environment.gov.au/minister/env/2000/sp25apr00.html

independently of developments internationally"

What this effectively means is that the Federal Government will consider any and all market based schemes to reduce carbon, but will act on none of them until there is international agreement on an appropriate scheme by the signatories of the Kyoto Protocol. This effectively means that the Federal Government will do nothing meaningful on creating a market for emissions in the foreseeable future. Instead, we will have to be content with putting in place administrative schemes that attempt to encourage or coerce producers to look at alternative technologies, or to entice customers into acting in an environmentally responsible way.

While these can be effective in reducing greenhouse gas problems, they are a poor cousin to a market-based scheme that internalizes the cost of emitting greenhouse gases into the energy sector. The key to the success of initiatives such as emissions trading is government, community and business working together. The Carr government has recognised that all Australian governments have a responsibility to the community to deliver real reductions in emissions. We also have a responsibility to provide business with a flexible framework that will allow targets to be met at the least cost.

Requirements to reduce emissions can be disruptive if we choose to ignore them, or they can be a trend that we manage and steer to a successful outcome. To succeed, however, we have to be pro-active and innovative in our policies and actions. This is not a zero sum game. We have been proactive on greenhouse, but we have sought to create opportunities rather than costs.

This is the foundation of the NSW Government approach - creating market opportunities. Clearly, though, the longer we delay, the harder it will be to reach greenhouse reduction targets. That is why NSW cannot support the "wait and see" approach which has been adopted by the Federal Government. There is a global imperative to address climate change and it will not go away. But I believe there are also other good reasons to act now. There is a first mover advantage for NSW and Australia if we face up to this issue now. That's why we developed carbon rights legislation, believed to be the first in the world. We undertook the first real trades for carbon sequestration in Australia.

I would like to point out that NSW has not developed an emissions trading scheme, as opposed to the framework for carbon rights, as such a scheme needs to be implemented at a national level. Industry works within a national economy, and an emissions trading scheme needs to be developed at a national level.

All of this is about realising an environment in which investments in renewable energy, emissions reductions and carbon sequestration make good commercial sense. Consistent with this approach, State Forests of NSW released an Information Memorandum earlier this year to attract investment in planted forests for carbon offsets. As a result, the Tokyo Electric Power Company recently signed a letter of intent with State Forests to establish up to 40,000 ha of forest in the coming decade. It's a deal that could be worth up to $120 million of investment in our state. And I believe more such investments will follow.

This early private carbon market in no way reduces the need for early introduction of a national emissions trading regime Australia-wide. But it does allow Sydney to position itself as a major global centre in the carbon market and in other emerging environmental securities. The NSW Government has recognised the need to develop a market, establish the property rights and allow industry to work within that framework, rather than leave them with no framework. Something the Federal Government seems intent on doing.

Doing nothing until 2008 is not an option – not for government and not for industry. All that delay does is increase the risk profile for investors in the greenhouse solution for the next 8 years. It's about helping the economy to adjust in a planned way rather than forcing a solution at the last minute. We can turn problems into opportunities, threats into new markets and potential impacts into new jobs - that is the foundation of our strategy for NSW.

Conclusion

In conclusion, governments can and should play a key role in the management of the energy sector, and particularly as it relates to the management of the environment. In the first instance the government should identify opportunities to allow goods and services to be provided by a competitive market. If this is possible, then the government should implement such arrangements. When the government has established these market arrangements, it needs to put arrangements in place to preserve competition and deny producers the opportunity exploit market power.

Where competition is not possible, then government needs to consider regulation as a way of protecting the interests of consumers. But it should only do this if regulation is better than a poorly operating market.

In terms of the energy sector and the environment, the government needs to go one step further than creating a market, it needs to create property rights so that a market is a possibility. This needs to happen as matter of urgency, or we burden the entire community with expensive solutions. It simply is not good enough to wait for someone else to act.

The NSW Government has taken the lead and established a firm set of policies to allow the market to operate effectively.

The Geopolitics of Energy into the 21st Century

*Executive Summary**

Introduction

The Center for Strategic and International Studies launched its Strategic Energy Initiative eighteen months ago on the premise that the benign global energy situation that has prevailed since the late 1980s masks two dangers.

- First, it obscures significant forthcoming geopolitical shifts that could affect future global energy security, supply and demand;
- Second, it leads to complacency among policymakers and the public about the need to incorporate long-term global energy concerns into near-term foreign policy decisions.

This report assesses the international energy supply and demand relationships likely to prevail in the next two decades. It highlights the different ways that geopolitical developments may affect global energy markets between now and 2020. In light of the world's future energy needs, it points out the contradictions inherent in some of the foreign policies pursued by the United States and other Western governments. Finally, the report offers policy considerations that could help ensure that adequate energy supplies are available to meet projected worldwide demand; that these supplies are not excessively vulnerable to major interruptions; and that they are produced in ways that minimize damage to the environment.

Energy Outlook to 2020

During the next twenty years, providing there is no extended global economic dislocation, *energy demand* is projected to grow by over 50 percent. This growth will be unevenly distributed, increasing in the industrialized world by some 25 percent while doubling, from a much lower base, in the developing world, with Asia accounting for the bulk of this increase.

This growing energy demand will be met over the next two decades in essentially the same ways as it is met now. *Fossil fuels* will provide the bulk of global energy consumption, rising from an 86 percent share in 2000 to 88 percent in 2020. Although *crude oil* will dominate global energy use and *coal* will retain its central role in electricity generation, *gas* use will increase noticeably. *Nuclear power* will decline, while *hydropower* will plateau. *Renewables* and *alternative energy* sources, while growing in absolute terms, will not capture a greater relative share of the market.

The most noticeable trend in the *relationship between energy exporters and importers* during this period will be the growing mutual dependencies between energy suppliers and consumers. Key aspects of this trend are as follows:

- The Persian Gulf will remain the key supplier of oil to the world market, with Saudi Arabia in the unchallenged lead.
- While the Gulf share of world oil production continues to expand, that of North America and Europe, the world's most stable regions, is projected to decline.
- The share of world oil production from the former Soviet Union is projected to increase, from 9 percent to almost 12 percent.
- Asian dependence on Gulf oil will rise significantly.
- European dependence on Gulf oil will remain significant, and U.S. dependence on imported oil will continue its steady growth.
- The European need for natural gas will be covered by a small handful of suppliers, Russia being the most significant.
- Anticipated growth in the use of natural gas must be accompanied by massive investments in this sector's infrastructure.

Geopolitics and Energy: A Symbiotic Relationship

How Might Geopolitics Affect Energy?

Four main geopolitical trends are likely to influence energy during the years ahead.

1 The behavior of world powers: In a world that has one superpower but is not unipolar, the potential for armed conflict in energy-producing regions will remain high. As a result, changes in U.S. alliance relationships in Europe, the Gulf, or Asia could have major impacts on global energy security. U.S. concerns over the proliferation of weapons of mass destruction and the desire to promote democratization and market liberalization around the world will also have a significant effect on key energy exporters. The future viability of the energy-producing states in the Caucasus will be shaped by the competing interests of Russia, the United States, and other regional powers. The rising dependence of China on Gulf oil could well alter political relationships within and outside the region.

2 The continuing domestic fragility of key energy-producing states: The world has been drawing its energy supplies from unstable countries and regions throughout the Twentieth Century. By 2020, however, fully 50 percent of estimated total global oil demand will be met from countries that have a high risk of internal instability. A crisis in one or more of the world's key energy–producing countries is highly likely in the next twenty years.

3 Globalization: Economic globalization will impose new competitive and political pressures on many of the world's leading energy producers. It will serve as a spur for growth in global energy demand. It could also lead to serious swings in energy demand since country-specific or regional recessions can now be quickly transmitted around the world.

4 The growing impact of non-state actors: Using new information technologies, NGOs will play a growing role in defining the ways that energy is produced and consumed. Terrorist groups, with access to the same technologies, will be in a position to inflict greater damage on increasingly complex energy infrastructures.

How Might Energy Affect Geopolitics?

There are four main ways in which energy may affect geopolitical outcomes:

1 The Negative Externalities of Swings in Energy Demand: A dramatic decline in global energy consumption early in the next century, brought on by economic recession, could trigger instability in many of the world's major energy exporting countries. Conversely, continually encouraged by rising energy demand, would place more power in the

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* The results of this study were presented by Guy Caruso, Executive Director of the CSIS during its preparation, at the 23rd International Meeting of IAEE, June 7-10 in Sydney, Australia.

hands of the exporters.

2 Competition for energy in East Asia: As countries in Asia seek to secure growing levels of energy imports, two geopolitical risks emerge. First, historical enmities might boil over into armed conflict for control of specific energy reserves in the region. Second, China might seek to build political and military ties with energy exporters in the Gulf that would be of concern to the United States and its allies.

3 Energy and Regional Integration: Energy infrastructure projects could serve to strengthen bilateral economic and political ties in certain instances. In Asia, for example, energy networks, along with trade liberalization, could serve to reduce historical tensions and place Asian economic growth on a firmer footing. Similar forces might come into play in Europe (linking Russia to the European Union) and in South Asia (drawing Bangladesh and India closer together), and in the Far East, linking Russia and China.

4 Energy and the environment: Environmental concerns will exercise increasing influence on energy issues in the next decades. Because the process of industrialization is so crucially linked to the factors believed to cause climate change, a new political fault line could emerge between developed and developing countries if no consensus emerges on an international strategy for reducing carbon emissions.

Policy Contradictions and Considerations

The interplay of geopolitics and energy early in the next century is at the root of an array of complex policy challenges that governments around the world must confront today. The three interlocking policy challenges are to ensure that (1) in the long-term, there will be adequate supplies to meet the world's energy needs; (2) in the short-term, those supplies are reliable and not subject to serious interruptions; and (3) throughout, they are produced and consumed in ways that are environmentally acceptable.

Energy Availability

Western policy today contains a fundamental contradiction. On the one hand, oil and gas exports from "rogue" states are expected to play an increasingly important role in meeting growing global demand, especially to avoid increasing competition for energy with and within Asia. However, the lack of a coordinated Western approach toward three of these rogue states– Iran, Iraq, and Libya – may prevent them from building the necessary infrastructure to meet the upward curve in energy demand in time.

A similar contradiction exists in U.S. policy toward the Caucasus and Central Asia, where the United States is committed to reinforcing the newly independent states, but where contrasting U.S. policies toward Iran, Turkey, and Russia are likely to restrict the construction of commercially-viable pipelines to export Caspian oil and gas. A policy approach that ties exports primarily to one pipeline route before the market viability of that route is known may undercut the pace of energy development in the region.

If Western governments are to ensure adequacy of supply early in the next century, they will need to take a more forceful approach toward encouraging key energy-producing countries to open their energy sectors to greater foreign investment. Increased private investment must be made today in production facilities, especially in the Gulf, and in transportation infrastructure, especially in Asia, if the world's energy supplies are to reach markets in sufficient quantities in 2010-20.

Policy Considerations

- Given the continuing importance of a small group of energy-producing countries to the future health of the global economy, **it is vital that the United States and other Western governments place diplomatic relations, trade policies, and foreign assistance programs with each of these countries at or near the top of their list of policy priorities.**
- In cases where major energy-producing countries run the risk of sanctions, **Western governments should make every effort to ensure that the coverage of the sanctions is as targeted as possible.** This should include a cost-benefit analysis of whether curtailing investment in, or revenue from, energy production will genuinely dissuade the target government from the specific behavior that provoked the imposition of sanctions.
- Oil and gas exports from the Caucasus and central Asia in a East-West transportation corridor could be a valuable alternative source of energy supply in the next century. **Providing that a "western route" bypassing Russia and Iran is feasible, Western governments should not obstruct the development of alternative routes that would ultimately offer these countries a diverse set of options to transport oil and gas to market**.
- It is in the self-interest of the United States and other Western governments to encourage China to diversify its sources of energy imports and not rely excessively on the Gulf. **Western policy-makers should assess whether tax incentives and concessional credits might encourage Western energy companies to help develop an import infrastructure both into China and on to other countries in the Far East.**
- **Western governments must use whatever political leverage they possess within key energy-producing countries to encourage market reforms that will improve the performance of the energy sector, including openings for foreign investment.** This would include, inter alia, provisions for the enforcement of contracts, guarantees for private property, anti-corruption measures, and stable tax regimes.

Energy Reliability

In the early decades of the 21st Century, because burgeoning energy demand must be met largely by a small number of oil and gas suppliers, the *risk posed by supply interruptions will be greater* than is presently the case.

In this context, the United States may seek relief from its self-imposed responsibility as the protector of the sea lanes around the world over which increasingly larger amounts of fuels will be transported. At the same time, there is no comparable protector for the increasingly important long-distance land-based energy transportation infrastructure in the next century.

Military conflict remains a threat to most energy-producing regions, particularly in the Middle East where almost two-thirds of the world's oil resources are located. In addition, domestic turmoil within key energy producing

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The Geopolitics of Energy into the 21st Century

(continued from page 17)

countries constitutes another threat to reliability of energy supplies. At least 10 of the 14 top oil-exporting countries are potentially unstable.

To meet these challenges to reliable supply, importing nations must engage in contingency planning. The practice of holding government-financed strategic petroleum reserves is one method of limiting the impact of supply interruptions, provided that the stocks held are truly reserved for the intended purpose. For the foreseeable future, however, it will be impractical and prohibitively expensive to hold strategic gas reserves.

Policy Considerations

- **The United States should retain as far as possible its ability to defend open access to the Gulf and international sea lanes.** At a time when the administration faces myriad competing demands for military and peace-keeping interventions, this mission should be considered a strategic priority and may call for greater emphasis on, and increased investment in, appropriate military capabilities.
- **U.S. allies in Europe and Asia should be prepared to shoulder a greater burden of the cost of sea lane protection** and should coordinate with the United States on the forces, capabilities, and deployments that would be least duplicative.
- As Western governments seek to defuse regional rivalries, they should place **special diplomatic emphasis on confidence building and other tension-reducing measures in areas that could threaten a serious interruption to oil and gas supplies**.
- In East Asia and the Gulf, **collaborative energy infrastructure projects could play an important role in lessening the risks of future conflict over energy resources.**
- **Governments must find new ways to protect critical energy infrastructure.** At a government-to-government level, international agreements to protect pipeline systems might have a deterrent effect. Governments must also find ways to work with the private sector to minimize the vulnerability of all energy infrastructures to sabotage or terrorist attack.
- **Governments should maintain and, where appropriate, expand government-financed and controlled strategic petroleum reserves.** This could include extending the IEA emergency preparedness program to non-members that will be major oil importers in the next century**.**
- The most feasible way in the near- to medium-term to mitigate the risks of interruptions to gas supply is to **encourage importing countries to promote a diversity of suppliers and pipeline routes.**

Energy and the Environment

The United States is unlikely to ratify the Kyoto Protocol in its present form, and, as a result, there is no coordinated global effort to reduce carbon emissions. Even as governments and NGO's continue to debate and negotiate the parameters of a ratifiable protocol and assess methods for implementation, they must also prepare for the eventuality that no effective agreement can be reached for an extended period. If they are to prevent the issue of global warming from growing into an increasingly contentious geopolitical issue, Western policymakers must prepare alternative policy initiatives in the interim.

There will be no easy solutions. "Clean coal" technology is beyond the economic reach of most developing countries. Switching from coal to natural gas will take time, since deliveries will be dependent on the construction of expensive natural gas pipelines and LNG liquefaction and regassification facilities. Nuclear power does not add carbon to the atmosphere but poses its own set of competing policy concerns, ranging from plant safety to waste disposal and nuclear weapons proliferation.

Policy Considerations

- **Western governments should design policies that will provide financial incentives for private voluntary action that has an immediate effect on reducing carbon emissions**.
- Governments in the developed world should also continue efforts to **gain developing country participation in an international program to reduce greenhouse gas emissions over the long-term.**
- As part of this process, **OECD governments should consider bilateral agreements with developing countries for joint reductions in greenhouse gas emissions.** These agreements could include a grant-aid component that would support institution-building and the transfer of technical knowledge to the developing country.
- At the same time, developed countries should **review the extent to which subsidies for domestic energy sectors are inconsistent with their global energy policies**.
- **OECD governments should sustain an up-stream research effort into new technologies that could make energy use more efficient, improve carbon capture and sequestration, and offer viable alternatives to fossil fuels**.
- **Policymakers should examine regulatory options to lessen the opportunity cost of bringing already demonstrated new technologies to market.**
- **Western governments should assess the conditions under which nuclear power could make a significant contribution to generating electricity in the developing world.** This would require, at a minimum, providing technical assistance to establish a culture of nuclear safety at the plants and strengthening measures to ensure against the diversion of fissile materials**.**

24th IAEE INTERNATIONAL CONFERENCE

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ENERGY BUSINESS METAMORPHOSIS
Redefining the energy industry, the energy business and the energy economist
Coming to terms with the New Economy
Industry consolidation: what's next?

SUSTAINING DEVELOPMENT
What is sustainable development and how should it be measured?
Market tools for sustainability
Balancing energy and environmental needs

RISK MANAGEMENT INNOVATIONS
Political risk assessment in investment decisions
Techniques for price risk management
Why risk management fails

NEW POLITICS AND ENERGY
Sub-national issues: how do they play in the end game?
New paradigms – markets, regions, corporate roles, NOC roles
The end of the oil era, what would it mean?

TECHNOLOGY TRANSFORMATIONS – EVOLUTION OR REVOLUTION?
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Joint Emergency Stock-holding Scheme for the APEC Oil Importers

*By Keiichi Yokobori, Masao Takagi and Rong-hwa Wu**

Introduction

Despite the recent economic slowdown caused by the Asian financial crisis and the sharp oil price increase in 1999, oil demand in the Asian economies within the Asia Pacific Economic Cooperation (APEC) region is projected to grow substantially in the coming decade (APERC, 1998). The region's oil imports are also expected to increase significantly due to the limited potential for oil production expansion inside the region. The APEC region, particularly the Asian APEC economies, will raise further their reliance on the Middle East, where concerns for political instability exist, and increase supplies passing through the narrow Strait of Malacca. Thus, the Asian APEC region's vulnerability to oil supply disruptions remains high. This requires serious considerations for strengthening oil security policy measures.

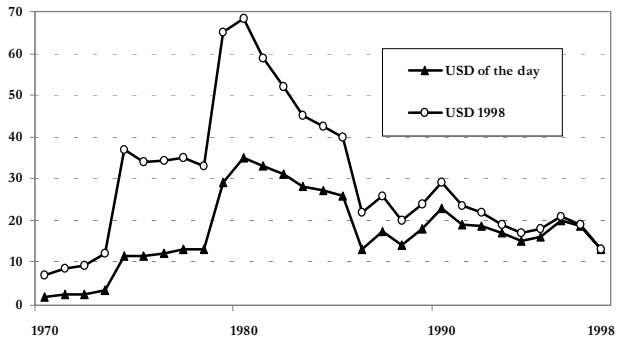
This study intends to present the net economic benefits of expanding emergency oil stocks for differing groupings of APEC economies, and to examine the value of joint oil stockpiling among Asian APEC economies.

Review of Oil Demand and Import Trends

The Asia Pacific Energy Research Centre published its updated Energy Demand and Supply Outlook in September 1998 based on the macro-economic projections provided by the Australian Bureau of Agriculture and Resources Economics (ABARE). Although economic recovery has not yet been confirmed in Japan or Indonesia, Korea, Thailand and other Asian economies, which had been adversely affected by the financial crisis, registered remarkable recovery in 1999, consistent with ABARE's projection. APERC's energy outlook projects a 4 per cent per annum growth in oil demand in Asian economies during the period of 1995 to 2010. Demand will grow from 668 million tons of oil equivalent (Mtoe) in 1995 to 968 Mtoe in 2010 under the baseline scenario. Under this scenario during the same period, imports grow from 406 Mtoe to 657 Mtoe, an increase of 62 per cent, raising import dependence from 61 per cent to 68 per cent.

Oil supply disruptions in 1973 and 1979-80 caused significant economic damage to OECD countries. Growing oil demand and imports by the Asian APEC region means that another serious oil supply disruption could cause serious economic losses to those economies. Further, as shown in Paik et al. (1999), oil supply disruptions would cause economic damage not only to oil importers but also to oil exporters; non-oil sectors account for a significant portion of the whole economy. Sharp oil price rises cause economic damage, including GDP losses and oil import cost increases. Crude oil prices doubled during the Gulf Crisis of 1990-91, although the magnitude of oil price increases was more moderate and its duration was much shorter than in the previous oil crises in 1973 and 1979-1980 (Figure 1). This largely resulted from increased oil production by other oil producers and the activation of the IEA's Contingency Plan, where oil stock release played a key role (Scott, 1994).

Figure 1
Oil Prices (1970-1998)



Source: BP Amoco (1999)

Economic Analysis of Expanded Emergency Oil Stocks

Paik et al. (1999) demonstrated net benefits of about 2.7 billion US dollars (USD) by expanding emergency reserves for the APEC region outside the U.S. by 600 million barrels (Mbbl). Based on the same set of assumptions and using the same methodologies, Leiby and Bowman (1999) ran additional simulations of expanding emergency stocks for the following five APEC economy groupings: All APEC; Asian Group I (China, Japan, Korea, Philippines, Singapore, Chinese Taipei and Thailand); Asian Group II (Asian Group I minus Japan plus Hong Kong, China); Japan alone; Asian Group III (Asian Group I minus China and Japan plus Hong Kong, China).

For these groupings, the study compares the net present values (NPV) of benefits (at an annual discount rate of 7 per cent) arising from the release of stocks in oil supply disruptions and NPV costs of holding emergency stocks by using the DIS-Risk model. The benefits include avoided GDP losses and avoided net import costs.

Figure 2 presents the base case simulation results, including the grouping of APEC minus the U.S. For the first three groupings, the net economic benefits of stock expansion exceed the costs of stockpiling, while the costs are greater than benefits for the remaining three groups. Specifically, the total net benefits for APEC as a whole will be highest at USD 10 billion when the reserve expansion reaches 1,000 Mbbl; it is USD 2.5 billion for APEC minus U.S. at 600 Mbbl; and a little less than USD 1 billion for 400 Mbbl.

The following conclusions could be drawn from this result:

- The larger the economy (or economy groupings), the larger the economic benefit. The net economic benefit is calculated on the basis of the impact of oil stock release on global oil price and the magnitude of economic benefits are roughly proportional to the size of GDP;
- The benefits of stock draw, or lower oil prices, through its effects on the world oil market, are shared by all oil consuming economies, although the cost of stockpiling is borne only by the economy that does stockpile. This is due

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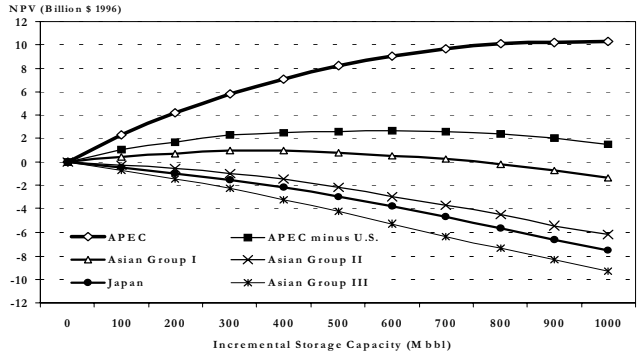
Figure 2
Net Economic Benefits of APEC Stock Expansion (DIS-Risk Model, ORNL)



Source: Leiby and Bowman (1999)

to the public good nature of emergency oil stocks;

- Figure 2 presents the result of the base case scenario. Under a more severe disruption scenario, the economic benefits would be larger. Even those three groupings of economies with negative net economic benefits might gain net benefits in such circumstances;
- The coordinated stock build and drawdowns would maximise the collective economic benefits and at the same time reduce the costs.

Coordinated Oil Emergency Stock Drawdowns as International Public Goods

Coordination of emergency response measures, as demonstrated by IEA countries and producers during the Gulf crisis in 1990-1991, constitutes international public goods, benefiting also those economies not holding emergency stocks. Many Asian APEC oil importing economies which did not participate in this response action benefited from the shorter and more moderated oil price increases resulting from the IEA coordinated stockdraw and other responses. However, continued free riding would cause the erosion of the effectiveness of such an oil supply security regime in an oil crisis.

The oil import coverage of IEA emergency stocks has been declining from a peak in 1986, while spare oil production capacity in oil producing economies is declining (Figure 3). The share of IEA countries in the world oil market is shrinking due to the growing share of non-IEA economies, particularly those in Asia. Many of these do not hold emergency stocks. Besides the U.S. and Japan who are holding significant oil emergency reserves to comply with their obligations to IEA, only Korea and Chinese Taipei have emergency reserves of oil. China and Thailand plan to create emergency oil stocks. But other oil importing economies in the APEC region do not maintain emergency stocks despite their growing oil demand and import dependence.

The expansion of oil emergency stocks by Asian APEC oil importing economies would prevent the weakening of the oil supply security scheme in an oil crisis, and would enhance the oil supply security of regional economies.

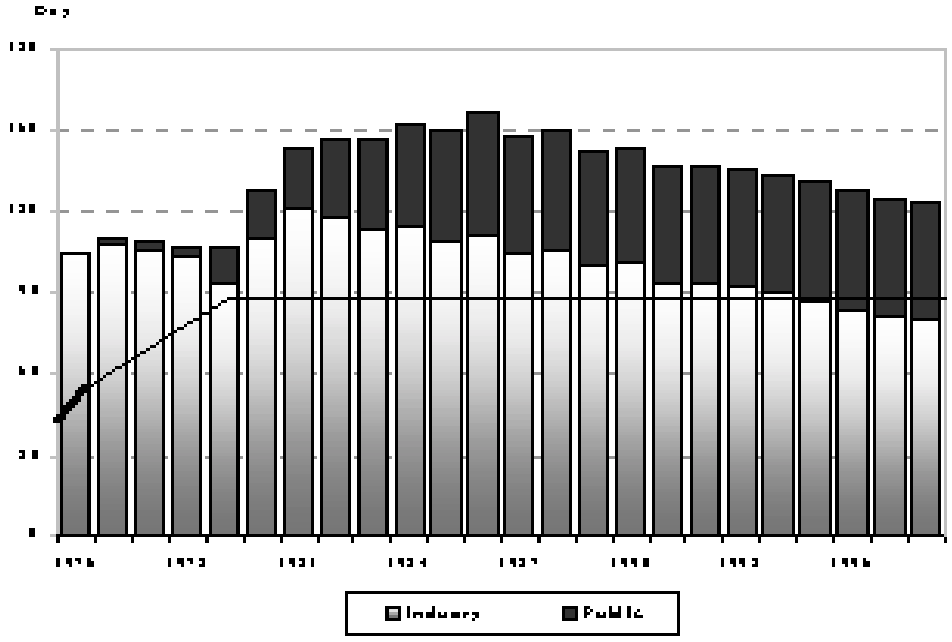
Illustrative Cases of Joint Stockpiling among APEC Economie

For smaller Asian economies particularly, emergency oil stock expansion through a joint oil stock-holding scheme with other economies would achieve an economy of scale, lower the cost of building and holding stocks and provide better stock management.

The earlier economic analysis suggests that stock size expansion by 30 to 40 days of net imports envisaged in 2010 under the APERC Outlook Baseline Scenario would result in net benefits for the APEC region. The size of 1000 Mbbl for APEC as a whole would correspond to 37 days of net imports in 2010; 600 Mbbl for APEC minus U.S. would correspond to 42 days; and 400 Mbbl for 7 Asian economies to 29 days. Considering the level of working stocks ranging from 30 to 40 days of demand (almost identical to days of imports in many import dependent economies), this level would correspond to 60 to 70 days of oil imports, namely the earlier mandatory stock levels for IEA countries. Considering fur-

(continued on page 22)

Figure 3
IEA Net Importers Stocks (Days of Net Imports)



Source: IEA (1999)

Stock-holding Scheme *(continued from page 21)*

ther the current IEA obligation level (encompassing both commercial and emergency stocks) of 90 days of net oil imports, the range of a 30 to 60 day level of oil imports for emergency stocks does not seem unreasonable for consideration by some Asian APEC economies.

This range of required oil stocks for smaller Asian APEC economies, encompassing Hong Kong, China; Philippines; Singapore; Chinese Taipei and Thailand (Asian Group IV); would amount to roughly 100 Mbbl to 200 Mbbl, or one to two units of large scale salt cavern storage, which offers the most economic facility studied by PB-KBB Inc., an expert engineering firm. The total capital costs would range from USD 551 million to 1102 million. According to data available from the Japan National Oil Corporation (JNOC), the corresponding capital costs of above ground storage, generally used in commercial storage, would range from nearly USD 2500 million to 5000 million (Table 1). The potential sites of appropriate salt caverns could be found in Thailand, Australia and other APEC economies.

Table 1
Emergency Oil Stocks, Import Coverage and Capital Costs (Asian Group IV)

Days of Net Import	**30 Days**	**60 Days**
Required stock level (Mbbl)	95.7	191.4
Salt Cavern		
Storage Capacity (Mbbl/unit x unit)	100 x 1	100 x 2
Capital Cost (Million USD)	551	1102
Above Ground Storage		
Storage Capacity (Mbbl/unit x unit)	0.7 x 137	0.7 x 274
Capital Cost (Million USD)	2493.4	4986.8

Source: PB-KBB (1998), APERC

An option, which might be more economic than building a new storage facility for jointly stockpiling emergency oil, would be to lease existing excess storage facilities within the APEC region. This arrangement would allow the deferral of the large construction cost associated with building new facilities. Oil sector restructuring may produce excess storage capacity as envisaged in Japan (Table 2).

Table 2
Oil Storage Capacity in Japan

	Tank Capacity
Refinery Owned Capacity (1,000 bbls) (Crude)	370,066
(Products)	277,364
Subtotal	647,430
JNOC Affiliated Capacity (Crude)	251,600
Total	899,030
Net Oil Imports In 2010(Base Case) (1,000 bbls/d)	5,617
Tank Capacity for the days of Net Oil Imports in 2010	160

Sources: Petroleum Association of Japan, Japan National Oil Corp., and APERC (1998).

The benefits would be further enhanced by cooperating with other oil importing countries (such as IEA countries) especially learning from IEA or EU experience and oil exporters who have the potential of surge production and would find common interest in development of such supply logistics as pipelines and storage facilities.

Naturally, the analysis of the benefits of expanding emergency stocks could be further advanced with the improved availability of information on stock building and holding, including their costs, more in-depth analysis with improved analytical tools and data, and incorporation of policy experience with the emergency response measures.

Conclusions

The economic analysis of the cost and benefits of emergency oil stock expansion suggests the benefits of enlarging the stock size by larger groupings of APEC economies in a coordinated manner. Such expansion would prevent the erosion of the effectiveness of the current oil emergency scheme as an international public good. Joint stockpiling by APEC oil importers would achieve an economy of scale and thus reduce the cost of stock holding and improve the efficiency of management of the stocks. An expansion of 30 days of net imports in oil stocks is suggested as a first step toward joint stockpiling by small Asian APEC economies.

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FIRST ANNOUNCEMENT

The Impact of the Middle East/Caspian Oil on Global Energy Markets

Saturday, 4th – Sunday, 5th November 2000 - Tehran, IRAN

Institute for International Energy Studies
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Dear Executives,

The Impact of the Middle East/Caspian Oil on Global Energy Markets

In light of ever increasing world demand for energy on the one hand and the profound importance of energy price and the current developments in the regional scene on the other, it is imperative for oil producers, consumers and companies to enter into a new and constructive dialogue towards better understanding of the concerns and the interests of the parties involved. This is particularly true, as we are now approaching the year 2001; the year designated by the United Nations as the year of International Dialogue of Civilizations, with especial emphasis on the need for strengthening peace and cooperation among nations.

To this end we are pleased to announce that the 5th IIES International Conference, scheduled to be held 4th and 5th November 2000, will focus on issues concerning the combined impact of the Middle East and Caspian Sea oil on the world energy markets with particular emphasis on producers, consumers and companies concerns as related to price, energy security, production capacities, resource availability, geopolitics and the necessity and inevitability of regional cooperation towards higher productivity, increased market stability and greater prosperity for all. Thus, we are certain that this conference which is expected to be attended by a large number of high ranking government officials, top oil and gas company executives, financiers, scientists and engineers, will provide a great opportunity for all participants to meet each other, exchange ideas, and voice their concerns for better working relations and safe guarding multilateral interests.

Yours truly,
S. A. Alavi

Conference Secretary-General

Speakers Include:

- **HE Bijan Zanganeh**
  Minister of Petroleum, I.R. of Iran
- **HE S. M. Hosseini**
  Deputy Minister of Petroleum – International Affairs, I.R. Iran
- **Prof. Peter Davies**
  Vice President – BP Amoco, U.K.
- **Prof. Robert Mabro**
  Director of Oxford Institute for Energy Studies, U.K.
- **Prof. Alexander G. Kemp**
  University of Aberdeen, U.K.

In addition, executives of international oil companies as well as high ranking officials from petroleum ministries of the Middle Eastern/Central Asian states and OPEC are invited.

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Conference Proceedings
22nd IAEE International Conference
Rome, Italy June 9-12, 1999

The Proceedings from the 22nd International Conference of the IAEE are available from IAEE Headquarters. Entitled *New Equilibria in the Energy Markets: The Role of New Regions and Areas*, the price is $99.95 for members and $119.95 for nonmembers (includes postage). Payment must be made in U.S. dollars with checks drawn on U.S. banks. Please complete the form below and mail together with your check to: Order Department, IAEE Headquarters, 28790 Chagrin Blvd., Suite 350 Cleveland, OH 44122, USA

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New USGS Estimates of Undiscoverd Oil and Gas Resources for the World

*By Thomas S. Ahlbrandt and Gene Whitney**

Abstract

Worldwide supply of oil and gas is ultimately linked to the geologic abundance and distribution of those fossil fuels. The U.S. Geological Survey is completing a new assessment of the technically recoverable undiscovered oil and gas resources of the world. Nearly 1,000 provinces were defined and known petroleum resources exist in 406 of these. A total of 76 priority provinces, containing over 95% of the world's known oil and gas, and 52 "boutique", or highly prospective, provinces are being assessed. Based upon our initial analyses, several observations are clear. First, our estimates of total undiscovered technically recoverable petroleum (oil, natural gas, natural gas liquids) resources will probably not differ greatly (+9.5%) from the world totals determined in the 1994 USGS world assessment. However, our estimates of undiscovered oil are up considerably (+24%), and their regional distribution differs significantly from previous estimates. Secondly, estimates of global undiscovered natural gas resources are smaller than previously estimated (-10.4%) largely due to decreases in the Former Soviet Union, and natural gas liquids resources are significantly larger than previous estimates because co-product ratio calculations were included in this assessment. In addition, field growth mean estimates of known oil and gas fields will likely equal quantities of undiscovered resources and are a critical component of any analysis of world oil and gas supply.

Introduction

The U.S. Geological Survey has conducted a series of assessments of undiscovered resources for both the U.S. and for the world. These assessments provide a snapshot of current information about the location and abundance of oil and gas resources at a point in history. Such an overview provides explorationists, economists, and investors a general picture of where oil and gas resources are likely to be developed in the near future.

The most recent previous world assessment of oil and gas was completed in 1993 (Masters and others, 1994, 1997). In that assessment, total undiscovered oil resources for the world were estimated to be 582.6 billion barrels (mean), and the total endowment of oil for the world was estimated to be 2,272.5 billion barrels (mode). Masters and others (1994, 1997) estimated that a total of 5,791.0 trillion cubic feet (tcf) of natural gas remained undiscovered (mean value), and they estimated the total endowment of natural gas to be 11,567.6 tcf (mode). Those estimates were determined using a modified Delphi process (Masters and others, 1994).

In 1995, the U.S. Geological Survey initiated a new geologic assessment of the world's oil and gas resources in response to the rapidly changing landscape of world petroleum supply. The political and economic framework in which oil and gas are produced, marketed, and consumed has evolved rapidly over the last few years. Changes have also been swift and significant in exploration technology, onshore and offshore production technology, and the quantity and quality of geologic and geophysical data available. The geography of exploration and production have also changed significantly, especially in response to new developments in offshore drilling and production technology. These rapid changes have generated both the need for and the ability to conduct a new global assessment of undiscovered oil and gas resources. The purpose of this paper is to summarize the results of the new USGS 2000 World Energy Assessment in the context of world energy supply.

Assessment Strategy And Methodology

In the current world oil and gas assessment, we divided the world into approximately a thousand provinces, based primarily on geologic factors, and these provinces were grouped into the eight regions roughly comparable to the eight economic regions defined by the U.S. State Department. A team of geologists was assigned to each of the eight regions to compile and interpret existing geologic information for evaluation of the oil and gas potential within each region and its provinces. Total petroleum systems and their subdivisions (assessment units) were defined in these provinces and are the basic unit of assessment used in our current assessment.

Significant petroleum resources are known to exist in 406 of the 1000 geologic provinces. By allocating historical production for approximately 32,000 oil and gas fields to the world's provinces, we were able to identify 76 provinces that account for over 95% of the world's known oil and gas. These 76 provinces were established as the highest priority provinces for detailed examination in this assessment. However, past production and discovery does not necessarily provide a rigorous indicator of future discoveries, so an additional 52 "boutique", or highly prospective, provinces were also selected for detailed examination and assessment, bringing the total number of provinces evaluated to 128, located in 96 countries and 2 jointly-held areas. An additional 17 assessment units were identified in which significant unconventional resources such as coalbed methane, basin-centered gas, gas hydrates, and heavy oil occur, but these were not assessed.

USGS geologists compiled data on each of these provinces to provide a scientifically defensible estimate of undiscovered oil and gas resources in each province. For each of the 128 assessed provinces, geologists defined total petroleum systems, which consist of all genetically related petroleum generated by a pod or closely related pods of mature source rocks (Schmoker and Klett, 1999). A total of 159 total petroleum systems were evaluated. Each total petroleum system was subdivided into assessment units that represent mappable volumes of rock within the total petroleum system that could be assessed. Approximately 246 assessment units were examined in detail. In each assessment unit, quantities of undiscovered conventional oil, gas, and natural-gas liquids were estimated that may potentially be added to reserves within the next thirty years (1995-2025). Thus, this assessment of the world's undiscovered oil and gas resources provides a geologic foundation of unprecedented detail in support of the resource estimates assigned to each assessment unit, total petroleum system, and allocated to provinces, regions, and onshore/offshore areas. All of the geologic

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characteristics are captured digitally in maps and databases, and these products will be published along with the final assessment numbers in a U.S. Geological Survey Digital Data Series #60 CD-ROM. Resource estimates are regularly revised during subsequent assessments, and we expect that the current results will be revised in the future as well. However, the detailed information we provide to support these assessment numbers allows the incremental incorporation of new data as they become available for each assessment unit and will allow for interim adjustment of resource estimates on a continual basis.

The numbers reported here are for conventional hydrocarbon resources only, and do not include unconventional oil and gas resources such as tar sands, heavy oil, or gas hydrates.

Results

Our estimates for undiscovered conventional oil, natural gas, and natural gas liquids are shown in Table 1 with assessed values from the USGS 1993 World Assessment (Masters, 1994). Our estimates for undiscovered oil have increased 24.3% over the 1993 World Assessment numbers, whereas natural gas is estimated to be 10.4% less than the previous assessment. Undiscovered natural gas liquids are 104% above the previous estimates. The total for undiscovered oil, natural gas, and natural gas liquids shows a modest 9.5% increase over the 1993 estimate for the world.

Table 1
Volumes of Undiscovered World Petroleum, by Commodity, from this Assessment (mean values, including the United States[1])

	USGS 2000 Assessment (this study)	USGS 1993 Assessment (Masters, 1994)
Undiscovered oil	724.2 billion barrels	582.6 billion barrels
Undiscovered nat. gas	5245.6 trillion cu. ft.	5791.0 trillion cu. ft.
Undiscovered natural gas liquids	209.1 BBOE[2]	102.2 BBOE
World Total	1807.6 BBOE	1650.1 BBOE

[1]U.S. values taken from the U.G. Geological Survey 1995 National Assessment

[2]BBOE = billion barrels of oil equivalent.

In addition to estimates of the undiscovered volumes of oil, natural gas, and natural gas liquids, we have also made an estimate for reserve growth (also known as field growth) for the world (Table 2). The phenomenon of reserve growth, in which original reserves estimates increase over time as exploration and production technologies and strategies improve, accounts for a significant amount of petroleum not currently accounted for under known reserves or undiscovered resources. In fact, the contribution of reserve growth to the world's oil endowment is only slightly less than then contribution from undiscovered oil (mean values). Likewise, reserve growth for natural gas is estimated to be about 63% of the undiscovered natural gas resources (mean values). Of course, there is significant uncertainty associated with reserve growth estimates because of uncertainties about future advances in exploration and production technology and uncertainty about prices. However, we feel that reserve growth has played a significant role in the increase in reserves in the past and will continue to be important, and perhaps increase in importance, in the future.

Table 2
Estimates of Reserve Growth for Various Petroleum Commodities for the World (exclusive of the United States)

Oil reserve growth	612 billion barrels
Natural gas reserve growth	3,305 trillion cubic feet
Natural gas liquids reserve growth	42 BBOE

The regional distribution of undiscovered resources is shown in Table 3. Although the relative abundance of oil and gas resources among the regions of the world is consistent with past estimates, we conclude in the current assessment that the Former Soviet Union and Asia contain significantly less natural gas than previously estimated, that the deep water resources in the South Atlantic and Middle East account for significant increases in undiscovered oil, and that North American (Canada and Mexico) resources of oil and gas are somewhat less than previously estimated.

Table 3
Volumes of Undiscovered Oil and Undiscovered Natural Gas by Region, Including Percentages of World Totals (mean values, exclusive of the United States)

Region	Undiscovered Oil (billion barrels)	Percent World Total	Undiscoverd Gas (trillion cubic ft.)	Percent of World Total
1: Former Soviet Union	116	17.9%	1611	34.5%
2: Middle East and North Africa	230	35.4%	1370	29.3%
3: Asia-Pacific	30	4.6%	379	8.1%
4: Europe	22	3.4%	312	6.7%
5: North America*	70	10.9%	154	3.3%
6: Central and South America	105	16.2%	487	10.4%
7: Sub-Saharan Africa and Antarctica	72	11.0%	235	5.0%
8: South Asia	4	0.6%	120	2.6%
World totals*	**649**		**4669**	

* Exclusive of the United States

Implications

Despite speculation that the industrialized world must move away from reliance on fossil fuels, it remains likely that demand for oil and natural gas will remain strong for at least a few more decades. According to our estimates, 75% of the world's oil endowment is now known but only about 24% of that endowment has been produced so far. Likewise, approximately 66% of the world's endowment of natural gas is now known, but only about 11% of the world's total natural gas has been produced so far. Of course, these numbers cannot be used to calculate a simple projection of petroleum depletion for the world, but the numbers suggest that hydrocarbons are not yet scarce on a global scale, but their location is largely known (25% of total oil endowment remains undiscovered and 33% of the world's total endowment of natural gas remains undiscovered).

The total global endowment of hydrocarbons is likely to be less important in determining future supply than the regional distribution of those resources. The fact that 35.4% of the world's undiscovered oil resources and 29.3% of the

(continued on page 31)

Perspectives on the Brazilian Petroleum and Natural Gas Industry in the 2000 to 2020 Period: The Results of a National Survey

*Edmilson Moutinho dos Santos**

Introduction

The coming of a new millenium almost coincides with the opening of Brazil to international oil and gas investors. It is, therefore, interesting to analyze the market perception regarding the perspectives for the Brazilian petroleum and natural gas industry to face the challenges of the next millenium. This work presents the results of a survey undertaken by the University of São Paulo, Brazil, from December 1999 to February 2000. We asked several participants on an email list, including different representatives from the government, academia, people from the oil industry, bankers and lawyers, about their perspectives for Brazil in the oil and natural gas world during the 2000 to 2020 period. After reviewing the methodology adopted in the survey, we summarize the results without identifying the individual answers, but trying to express the contradictions found among the different opinions as well as identifying the topics for which certainties do not exist. We conclude by underlining what we believe to have been the most important results of this survey.

Presenting the Questionnaire and the Methodology

The questionnaire was composed of the following questions:

- Question 1: What will the role of oil and gas in Brazil be during the period 2000 to 2020?
- Question 2: Which are the most important factors that will mark the evolution of the oil and natural gas industry in Brazil during the period 2000 to 2020?
- Question 3: How do you see the future evolution of international oil prices in the 2000 to 2020 period?
- Question 4: How will the competition develop in the Brazilian petroleum and natural gas industry during the period 2000 to 2020?
- Question 5: Will Brazil be competitive in the following areas: E&P Offshore? E&P Onshore? Downstream activities? And Natural gas?

The questions were sent by email to participants of a list called Oil Forum, which is also a University of São Paulo's initiative, bringing together different representatives from the Brazilian oil and gas industry, government, academia, bankers and lawyers. The participants were invited to contribute to the survey knowing that only the aggregate result of answers would be published. The questionnaire was sent at the end of December 1999, with the answers being received, also by email, from January to February 2000. In the next section, we summarize the results, trying to express the contradictions between the different opinions as well as identifying the topics for which certainties may not prevail.

* Edmilson Moutinho dos Santos is Professor in the Energy Program - IEE - University of São Paulo, Brazil. He would like to thank all participants of the University of São Paulo's email list, Oil Forum, which has been debating very actively about the different problems that affect the Brazilian and the international oil and natural gas industry.

Brazil's Perspective in the Oil and Natural Gas Business in the Period 2000 to 2020

For most participants in the survey, oil and natural gas will continue to be the world's main primary energy during the period 2000 to 2020. This twenty years period is considered too short for major changes in the global energy mix, with the development of any alternative energy that can provide the same cost/benefit relation in terms of energy quantity per volume per monetary unit as oil and gas do. Therefore, alternative renewable energies such as biomass, solar and wind will remain restricted to niche markets, finding it difficult to reach big energy consumers which demand large amounts of reliable energy. Hydrogen is believed to continue rising as a competitive energy source, being likely fully available by the middle of the new century. Meanwhile, it will increase its share in the transportation sector. However, over the 2000 to 2020 period, hydrogen, as well as electricity, will only be competitive for specific passenger vehicles and in smaller cities.

In the developed world, most responders believe that oil and gas will see their economic importance and political influence decline as the richest countries speed up their entrance into the New Economy, based mainly on information and communication. The amount of energy consumed per dollar of GDP created will keep falling in the United States as well as in Japan and West Europe. Total oil and gas demand in those countries will likely increase, but only marginally as compared with their economic growth.

As far as Brazil is concerned, most responders believe the country will see an increasing role for natural gas in the national energy matrix while the dependence on imported oil will likely decline over the 2000 to 2020 period. As the country opens up its upstream sector for private investors, it will boost national oil and gas production. Taking oil and gas together, Brazil, as other less developed countries, might become even more dependent on fossil fuels as natural gas strengthens its role in electricity generation, diminishing the relative share of hydropower generation. Since the country is making only minor efforts in developing alternative energies, most responders believe Brazil will keep its high dependence on hydrocarbon until the middle of the century.

By 2050, the country might actually start increasing its dependence on imported oil and natural gas again, as national production may no longer keep pace with the growth in national energy demand. This perspective can significantly change if the country restarts investing massively in new energy technologies. Brazil's perspectives for renewable energies such as solar, hydro and biomass are considered high, with fast prospect for market insertion.

The survey presents the evolution of the international oil prices as the most important variable that will determine how the international and national oil and gas business will evolve during the 2000 and 2020 period. If anything, the only certainty among the answers is the uncertainty about the future evolution of the oil prices. From those that believe a broad price stability at approximately 20 US$/barrel (at current dollar) will prevail over the next 20 years and those expecting continuing instabilities, with prices oscillating from 10 to 30 US$/barrel, we find no common ground. Some responders see oil prices declining to 10 US$/barrel or less, following productivity gains and cost reductions; others

foresee a rising curve with prices growing with more or less oscillation up to a sustainable 30 US$/barrel by the year 2020, reflecting oil and gas scarcity. However, within the range of 15 to 30 US$/barrel, most responders believe that international oil prices will cause no significant shift in the trends and competitive forces that are already in place in the international oil business.

With the end of the former national monopoly, and as long as newcomers start investing in the country and more transparency is achieved in the management of the Brazilian national oil company, Petrobras, and in the definition of the national oil policy and regulation, Brazil will be much more influenced by international oil prices. According to most opinions, Brazil, in terms of upstream activities, must be seen as an important alternative Non-OPEC country. The country's competitiveness depends on the behavior of international oil prices whose collapse to 10 US$/barrel or less may undermine Brazil's position in the global upstream business. With prices oscillating within the 15 to 30 US$/barrel range, Brazil is competitive and can attract upstream investors. In downstream activities and with natural gas, Brazil's competitiveness is primarily founded on its internal market, with a high propensity to grow faster than the world average.

The opening up of the former national monopoly and the development of new technologies, especially for deep-water offshore activities, will certainly be the two major driving-forces in the Brazilian upstream industry. In addition, new business and technological approaches are expected to appear and increase the competitiveness of Brazilian onshore activities, which might be especially attractive for small-and-middle-sized oil companies. In the downstream sector, the entrance of new players and the full opening of the market for oil product imports are also expected in the 2000 to 2020 period. The major challenges for Brazilian refineries are seen as the need of strong cost reductions and the improvement of both refined product quality and of operations to comply with more stringent environmental and safety regulation. In addition, as natural gas is expected to substitute for fuel oil in important industrial markets, major investments will be needed in refining upgrading units.

For natural gas, the national consumption is expected to increase quite steeply. In power generation, natural gas will favorably compete with hydropower and other energy sources such as biomass, fuel oil, nuclear and coal. Nevertheless, in the shorter term, many barriers such as price and market uncertainties must still be removed. Other final consumers will also gradually perceive the advantages of natural gas, raising their acceptance of this energy source. However, more sophisticated gas markets will only develop if heavy investments take place in building up the transportation and distribution infrastructures.

Regarding the future competition scenario within the country, the most obscure factor is whether or not (and when and how) the Brazilian national oil company, Petrobras, will be privatized in the 2000 to 2020 period. Several responders do not expect Petrobras' full privatization over this 20 years period, believing the company still has a role as a state-owned enterprise that will allow the government to go through a long transition period towards a more competitive market. Some answers point out Petrobras' privatization as essential condition to construct this competitive market. In addition, some responders are convinced that the state-company will only be competitive if detached from its current governmental budgetary constraints. Regardless of its status, Petrobras will nevertheless have to compete with other players both in the upstream and downstream sector as well as in the natural gas segment.

As far as the upstream is concerned, most answers suggest that the Brazilian geological and technological competitiveness is already proved in offshore activities and particularly in the deep-water offshore areas. Onshore prospects are still seen by most participants as something with low geological competitiveness and low attractiveness for larger international oil companies and for the introduction of necessary new technologies. Some responders believe, on the other hand, that Brazil will hardly experience a major upstream boom during the 2000 to 2020 period. Brazil is still perceived as a country with high political and economic risk. Macroeconomic stability is far from being accomplished and oil is seeing by the government as a "cash cow" (government take on high-prospect offshore activities is high; there is no incentive for low-prospect offshore and onshore investments; indirect taxation is confusing and with important impacts on upstream projects). Furthermore, social pressures arise everywhere in the domestic political scene and may eventually shift the current political color, pro-foreign direct investments, towards more nationalistic movements, scaring potential oil investors. According to those opinions, Brazil will stand as just a minor Non-OPEC player in the global upstream business.

Despite any further extensive consideration, most responders believe Brazilian domestic upstream competition can still deepen over the next 20 years period, although Petrobras is unlikely to lose its leadership and ability to orchestrate domestic competition. By entering into partnerships with private investors, Petrobras will be required to develop more transparency and a more commercial behavior. The national company will also have to compete with other players to acquire new exploration and production areas in the country through the bidding processes organized by the National Petroleum Agency (ANP). From 2001 and on, the company will start relinquishing some of its current exploration areas, opening new opportunities for ANP to grant those areas to new investors. On the other hand, as Petrobras starts its plan to restructure its upstream asset portfolio, giving up some E&P areas, there might be more room for the birth of other small-and-middle-sized private oil firms. In spite of all those expected evolvements, the domestic upstream competition in Brazil will remain healthy over the whole 2000 to 2020 period. According to most responders, competition may only become fierce if international oil prices decline towards the 10 US$/barrel level and/or when larger-and-with-more-impact projects become scarcer in the country (possibly not before 2020).

For downstream activities, the competition issue is believed much more complex and the survey hardly found a dominant opinion. As far as the economic scale and the growth potential are considered, Brazil is certainly seen as a competitive market with strong attractiveness for potential investors in new refining, distribution and marketing activities. However, in an open market environment, domestic production will have to compete with imported refined

(continued on page 28)

Perspectives on Brazil *(continued from page 27)*

products coming from Argentina, the Mediterranean region, the U.S. Gulf Coast and/or from Venezuela and the Caribbean area. As believed by some responders, in the short and middle term, maybe up to 2005, the availability of idle capacity in those exporting regions may diminish the interest of building new refineries in Brazil. Competition will take place only between domestic and imported products, with an important location advantage for national refiners. As long as Petrobras keeps its almost full monopoly on the Brazilian refining industry, competition will be restricted, and the national oil company will alone enjoy this geographic advantage. The strategy to speed up competition in the Brazilian downstream sector divides the survey's responders into two groups. The first group believes the partial privatization of Petrobras' refineries will speed up the entrance of newcomers and, therefore, the competition in the Brazilian refining sector. Petrobras should speed up downstream investments abroad offsetting losses of market share domestically. The second group holds that this strategy violates the current global concentration trend, compromising the Brazilian national oil company's ability to compete globally with other mega-players. Among those supporters, some responders believe the government would underrate Petrobras' value by splitting up its downstream assets rather than privatizing the company as a block.

The answers have also highlighted some future perspectives for the distribution and marketing sectors. Again, no common ground is found. On one hand, some responders suggest the continuous strengthening of small-and-very-small companies, playing a strong focus strategy and conquering the loyalty of local consumers through personal attention and a long-term relationship, will gradually reduce the power of big distributors and marketers. On the other hand, we find answers pointing out concentration as the major driving force. The development of small players is seen as a transitory phenomenon. The most successful small players will end up on the hands of a big company. Acquiring such companies might be the easiest strategy for entry into the Brazilian market. Small companies will be restricted to insignificant niche markets. The only common opinion among most responders is the general view that distribution and marketing margins might decline over the 2000 to 2020 period.

As far as natural gas is concerned, the current infant industry has an enormous growth potential. Petrobras as well as many international and national private companies look for the best opportunities to position themselves in this new market. In the first step, the most prominent gas distribution companies have been privatized and distribution monopolies were transferred to private agents. High-pressure transportation infrastructures are still in Petrobras' hands, through its gas branch, Gaspetro, although Gaspetro shares its most important asset, the Bolivia-Brazil gas pipeline, with other international private actors through the company called TBG. From an optimistic scenario, where the market was expected to grow steeply, mainly through gas-fired power stations, the industry dived into a structural impasse with many price and market uncertainties slowing down investment decisions. As agreed by most responders, over the 2000 to 2020 period, competition will probably be almost absent in the construction of the Brazilian natural gas industry. Regional private monopolies will dominate gas distribution. Petrobras will keep a large majority share in gas transportation and production. The government will take the whole risk on gas-fired power generation, securing private investors from commercial and financial risks.

Conclusion

This survey clearly shows that, according to Brazilian experts, the oil and natural gas industry is expected to decline in importance as a leading business in the more developed world. Gradually, other sectors such as the information and telecommunication industries will surpass the oil and natural gas sector in terms of economic and political power. However, oil and gas will still be the world main primary energy, fueling global economic development during the period 2000 to 2020. In Brazil, the economic context is different and the energy sector, and particularly the oil and gas industry, will continue being the nation's greatest business. Oil and gas will still hold strong economic and political influence, fueling national economic growth, attracting private investment and creating the necessary energy basis for Brazil to also enter the new information and communication economy. The market perceives those two different realities when it analyzes Brazilian potential in the global and natural gas industry.

Another important conclusion from this survey suggests that Brazil seems reasonably competitive in oil and gas activities, particularly if international oil prices move within a 15 to 30 US$/barrel. This price scenario is convincing. That is why Brazilian specialists fairly believe the country will maintain its competitiveness to attract investments, although a very big and sustainable oil and gas boom is more questionable over the considered 20 year period. Therefore, although optimistic, the market seems cautious in forecasting the future. Moreover, the market recognizes major uncertainties and their potential impacts on the evolution of the national industry. Realism seems less present regarding the natural gas sector. Here, given the absence of tradition and the infancy of the industry, the market seems much more confident of a brilliant future despite important obstacles that are still in place slowing industry development.

Also essential to mention is that the survey's results show a discerning view of the market, dismissing traditional Brazilian nationalistic feelings, which used to indicate some market immaturity. According to the responses presented in this survey, the specialists are aware of Brazil's potential and difficulties as well as of the country's competitive advantages and disadvantages in the oil and the natural gas business. The general understanding is that Brazil is still far on the road of defining and establishing adequate and pro-active actions that can transform the country into a really attractive zone for oil and gas investments. Yet the general belief is that the new institutional order will be more successful in screening out and selecting those actions. Finally, the survey concludes that, over the 2000 to 2020 period, the time may turn out to be too short for creating strong competition in the Brazilian oil and gas market, diminishing the influence of the country's former state-controlled monopolies. However, the opening up process will continue advancing, gradually changing the competition environment.

Sweating Through Hot Summer In California

*By Fereidoon P. Sioshansi**

Wednesday,14 June, was an unusually hot day in Northern California. New temperature records were set in San Francisco and beyond. As previously reported , there was not enough generation, nor transmission, capacity to meet the load. Prices at the California Power Exchange (Cal PX) soared. Pacific Gas & Electric Company (PG&E) had to invoke rolling blackouts affecting some 100,000 customers—including some in the heart of Silicon Valley.

Worse yet, June 14 was not even a summer day. The *really* hot summer days in California usually occur much later, in August to October. Embarrassed officials at the PX and the ISO, the regulators, the independent generators, and distribution companies, are all doing their best to explain why getting thought the summer months is going to be, shall we say, *difficult.*

The public doesn't understand how something like this can happen in a supposedly advanced economy state like California. Many hi tech companies in Silicon Valley, like Sun Microsystems, have decided that they can no longer rely on their traditional suppliers for reliable service. Those who need reliable power— and who doesn't—are building their own back-up generators. No price is too high to pay when you, and your customers, rely on 24/7 operations. This includes companies with routers, servers, remotely accessible databases, and APS (application service providers). The same goes for many dot.coms whose only means of livelihood is through the Web.

The capacity shortfall and high energy prices have resulted in unexpected developments in California and elsewhere. Many energy-intensive industries have learned that they can make a lot more money by shifting, reducing, or entirely shutting down their operations. Firms can earn more money by supplying *negative* load than producing widgets because the price of energy is so high during tight capacity periods. Aluminum smelters as far away as the state of Washington have shut down because it makes a lot more sense to transmit power to energy hungry California than to produce aluminum. Guess what? With over 6% of the world aluminum smelter capacity affected, aluminum prices are rising.

Officials at the California Energy Commission, the agency responsible for long-term adequacy of energy supply in the Golden State, are in an awkward position. They went to great lengths to explain that 26 new power plants with 16,000 MW of additional capacity have been approved, or are under review for approval. That would add a comfortable safety margin to the current non-existent reserve margin. But none of this is expected to come on line until next summer—at the earliest. Three plants already approved and under construction are expected to be completed next year, with another two in 2002. But the 3,700 MW capacity of these five units will not help the tight capacity situation this summer, nor next.

Meanwhile, California continues to attract some 600,000 new residents each year. Its peak demand is expected to exceed 50,000 by 2003. As is usually the case, things are likely to get a lot worse before they get any better.

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Scenes from Sydney

Peter Davies helps Tony Owen and his wife celebrate their wedding anniversary.

On the dinner cruise: Paul Tempest and Michelle Foss.

Past Presidents Dennis O'Brien and Hoesung Lee with Carol Dahl.

More Scenes from Sydney

Peter Davies recognizes Bob Bartles and Denzil Fiebig for the Sydney Programme.

Guy Caruso and party enjoy the dinner cruise.

The ice sulpture and the food vied for top billing.

Mike Lynch, Perry Sioshansi and party enjoy the opening reception.

Peter Davies presents Hoesung Lee with his Past President's award.

A hungry group aboard the dinner cruise.

USGS Estimates *(continued from page 25)*

world's undiscovered natural gas resources reside in the Middle East and North Africa conjures familiar political and economic scenarios. However, the unexpectedly large volumes of oil and gas along the Atlantic margins of South America and Africa, combined with reduced estimates of hydrocarbons in North America, provide a basis for some interesting new twists in supply-demand scenarios.

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U.S. Geological Survey National Oil and Gas Resource Assessment Team, 1995, 1995 National Assessment of United States Oil and Gas Resources: U.S. Geological Survey Circular 1118, 20pp.

IAEE Meeting At the Annual ASSA/AEA Conference

The International Association for Energy Economics will be having its 3rd Annual Session at the Allied Social Science Association in New Orleans, Louisiana, USA January 5 - 7, 2001. If you attend the ASSA meeting please register as a member of IAEE. With more members attending we will be able to increase the number of sessions. We hope to see you there.

Session Title:

Current Issues in Energy Economics and Energy Modeling (Q4)

Presiding: *Carol Dahl*, Colorado School of Mines

Boris Cournede, Ministry of Economy, Finance, and Industry, Paris, France—The Special Economics of Gas Deregulation on the European Continent

Prakash Loungani, International Monetary Fund—21st Century Oil Shocks: Will They Occur? Will They Matter? Will We Be Prepared?

Prasad Rao, The Pennsylvania State University—The Choice of Crude Oil Quality in Petroleum Refining

Anne Epaulard and *Stephane Gallon*, Ecole Nationale de la Statistique et de l'Administration Economique, Malakoff, France and Ministry of Economics, Finance and Industry, Paris, France—A Model of Competition Between Nuclear and Gas-Fired Plants Using Real Options Theory to Assess Nuclear Investment Value

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Publications

The Model Oil and Gas Company, Michael R. Smith (2000). Price: £ 395 / US $ 632. Contact: Financial Times Energy, Maple House, 149 Tottenham Court Road, London W1P 9LL, UK. Phone: 44-20-7896-2241. Fax: 44-20-7896-2121. Email: orders.energy@ft.com

Arab Oil & Gas Directory 2000, (2000). Price: $1,240. Contact: Arab Petroleum Research Center, 7, avenue Ingres, 75016 Paris. Phone: 33-1-45-24-33-10. Fax: 33-1-45-20-16-85. Email: aprc@arab-oil-gas.com URL: http://www.arab-oil-gas.com

Economic Evaluation of Bids for Nuclear Power Plants. Price 710 Austrian schillings. 224 pp., 21 figures. Contact: International Atomic Energy Agency, Sales & Promotion Unit, Division of Conference and Document Services, PO Box 100, Wagramer Strasse 5, A-1400 Vienna, Austria. Fax: 43-1-2600-29-302, Email: sales.publications@iaea.org

Calendar

4-8 September 2000, Negotiation and Decumenting Petroleum Industry Transactions. Univeristy of Dundee, Scotland, UK. Contact: Jacquie Hay, Marketing Assistant, Centre for Energy, Petroleum and Mineral Law & Polidy, University of Dundee, DD1 4HN, United Kingdom. Email: cepmlp@dundee.ac.uk URL: www.dundee.ac.uk/cepmlp

10-11 September 2000, Oil Prices and Investment Retreat. Le Meridien Picadilly, London, England. Contact: Jonathan Neale. Phone: 44-2-7704-6241. Fax: 44-2-7704-8440. Email: jneale@thecwcgroup.com URL: www.thecwcgroup.com

11-13 September 2000, 2nd Annual Africa Infrastructure 2000. Crowne Plaza Hotel, South Africa. Contact: Global Pacific & Partners International, Houston: Phone: 281-597-9578, Fax: 281-597-9589. South Africa: Phone: 27-11-782-3189, Fax: 27-11-782-3188. Email: babette@global.co.za URL: www.glopac.com, www.glopac.com

11-15 September 2000, Natural Gas Negotiations and Contracts. University of Dundee, Scotand, UK. Contact: Jacquie Hay, Marketing Assistant, Centre for Energy, Petroleum and Mineral Law & Polidy, University of Dundee, DD1 4HN, United Kingdom. Email: cepmlp@dundee.ac.uk URL: www.dundee.ac.uk/cepmlp

11-15 September 2000, Hyforum 2000: The International Hydrogen Energy Forum 2000. Munich, Germany. Contact: Mrs. Sandra Hoderlein or Mr. Wolf Rasch, EFO Energie Forum GmbH, Godesberger Allee 90, D-53175 Bonn, Germany. Phone: 49-228-95-95-6-0. Fax: 49-228-95-95-6-50. Email: hyforum2000 @zukunftsenergien.de URL: www.hyforum2000.de

14-15 September 2000, World LNG Conference. Meridien Waldorf Hotel, London, England. Contact: Jonathan Neale. Phone: 44-2-7704-6241. Fax: 44-2-7704-8440. Email: jneale @thecwcgroup.com URL: www.thecwcgroup.com

17-22 September 2000, Natural Gas: The Commercial and Political Challenges (Training Course). The Four Pillars, Oxford, England. Contact: Margaret Coen, The Alphatania Partnership, Rodwell House, 100 Middlesex Street, London E1 7HD, United Kingdom. Phone: 44-20-7650-1405. Fax: 44-20-7650-1401. Email: training@alphatania.com URL: www.alphatania.com

17-23 September 2000, African Petroleum Management Institute/Upstream Leadership Program 2000. Johannesburg, South Africa. Contact: Global Pacific & Partners International, Houston: Phone: 281-597-9578, Fax: 281-597-9589. South Africa: Phone: 27-11-782-3189, Fax: 27-11-782-3188. Email: babette@global.co.za URL: www.glopac.com

18-22 September 2000, UK Oil and Gas Law. Russack's Hotel, St Andrews, Fife, Scotland, UK. Contact: Jacquie Hay, Marketing Assistant, Centre for Energy, Petroleum and Mineral Law & Polidy, University of Dundee, DD1 4HN, United Kingdom. Email: cepmlp@dundee.ac.uk URL: www.dundee.ac.uk/cepmlp

(continued on page 32)

Calendar *(continued from page 31)*

23-24 September 2000, Pacific Petroleum Insiders. Raffles Hotel, Singapore. Contact: Vimla Mulchand, Managing Director, The Conference Connection, Raffles City Post Office Box 1736, Singapore 911758. Phone: 65-226-5280. Fax: 65-226-4117. Email: mpgc@cconnection.org URL: www.cconnection.org

24-27 September 2000, 21st USAEE/IAEE N.A. Conference – "Transforming Energy." Philadelphia, Pennsylvania, USA. Contact: IAEE Headquarters, 28790 Chagrin Blvd., Ste. 350, Cleveland, OH 44122. Phone: 216-464-5365. Fax: 216-464-2737. Email: usaee@usaee.org URL: www.usaee.org

25-26 September 2000, Energy Utilities Advanced Valuation. N.M. Rothschild & Sons, London. Contact: Jacquie Hay, Marketing Assistant, Centre for Energy, Petroleum and Mineral Law & Polidy, University of Dundee, DD1 4HN, United Kingdom. Email: cepmlp@dundee.ac.uk URL: www.dundee.ac.uk/cepmlp

27-29 September 2000, 2nd International Conference on Energy Efficiency in Household Appliances and Lighting. Naples, Italy. Contact: Edgardo Curcio, AIEE, Via Giorgia Vasari 4, 00196 Roma RM, Italy. Phone: 39-06-322-7367. Fax: 39-06-323-4921. URL: www.aiee.org

27-29 September 2000, 7th Annual Africa Upstream 2000. Cape Town, South Africa. Contact: Global Pacific & Partners International, Houston: Phone: 281-597-9578, Fax: 281-597-9589. South Africa: Phone: 27-11-782-3189, Fax: 27-11-782-3188. Email: babette@global.co.za URL: www.glopac.com

28-29 September 2000, Converging European Energy Markets-How to Make it Happen. Crowne Plaza Hotel, Brussels. Contact: Jacquie Hay, Marketing Assistant, Centre for Energy, Petroleum and Mineral Law & Polidy, University of Dundee, DD1 4HN, United Kingdom. Email: cepmlp@dundee.ac.uk URL: www.dundee.ac.uk/cepmlp

2-4 October 2000, Commercial Opportunities in Renewable Energies. London, UK. Contact: Juliane Jung, CWC Associates, Phone: 44-20-7704-9155. Fax: 44-20-7704-8440. Email: juliane.jung@cwconferences.co.uk URL: www.globalenergyintel.com

2-4 October 2000, Chinese Petroleum & Gas Conference. Beijing, China. Contact: Vimla Mulchand, Managing Director, The Conference Connection, Raffles City Post Office Box 1736, Singapore 911758. Phone: 65-226-5280. Fax: 65-226-4117. Email: mpgc@cconnection.org URL: www.cconnection.org

15-20 October 2000, The Gas Chain: From Reservoir to Burner Tip (Training Course). Cricklade Wiltshire, England. Contact: Margaret Coen, The Alphatania Partnership, Rodwell House, 100 Middlesex Street, London E1 7HD, United Kingdom. Phone: 44-20-7650-1405. Fax: 44-20-7650-1401. Email: training@alphatania.com URL: www.alphatania.com

23-24 November 2000, 4th Annual Africa Downstream 2000. Johannesburg, South Africa. Contact: Global Pacific & Partners International, Houston: Phone: 281-597-9578, Fax: 281-597-9589. South Africa: Phone: 27-11-782-3189, Fax: 27-11-782-3188. Email: babette@global.co.za URL: www.glopac.com

November 2000, Renewable Energy: Advancing Technology for Industrialisation and Sustainable Development. Brighton, UK. Contact: Robert Pinheiro. Phone: 44-1865-302704. Fax: 44-1865-557368. Email: robert.pinheiro@britishcouncil.org

7-8 November 2000, 15th Annual Autumn European Gas Conference. Edinburgh. Contact: EconoMatters Ltd., Rodwell House, 100 Middlesex Street, London E1 7HD. Phone: 44-20-7650-1430. Fax: 44-20-7650-1431. Email: confs@economatters.com URL: www.gas-matters.com

14-15 November 2000, Natural Gas Conference. Toronto, Ontario, Canada. Contact: Industrial Gas Users Association, Phone: 613-236-8021. Fax: 613-230-9531. Email: igua@magma.ca

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