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President's Message

It is a great privilege and honour to serve as president of our IAEE organization for year 2001 and to welcome you to the first 2001 edition of IAEE Newsletter. I am particularly delighted to have the opportunity to serve during a very active period of the organization and with a lot of international energy challenges. The energy world is in the midst of fundamental changes in terms of markets and prices, deregulation and industrial structure, technology and energy and environmental policy. Deregulation in the different markets is moving foreward. The restructuring of the petroleum and energy industry the last couple of years has been fundamental. E-commerce will definitivly influence the energy industry and trade patterns. Technology offers significantly increased efficiencies for all energy sources. On the global warming issue the delegate at last year's summit at the Hague failed to find an agreement to follow up the Kyoto target of redused CO_2.

During the 21 years since it was started in 1979, IAEE has established itself as the leading international organization within energy economics. The organization serves energy economists and other professionals working with energy economics in 65 countries around the world with a global membership of 3100. Over the years IAEE has developed major services to its members and others interested in energy economics: *The Energy Journal* is the major referreed journal of energy economics. Other services include the quarterly *IAEE Newsletter*, the Annual International Conference and the Annual North American Conference, Regional Conferences and the professional program, meetings and seminars of 24 affilites and chapters. Our organization lives and relies on input and work from quite a number of active people in all our member countries.

I am delighted to welcome new members to the Council for 2001: Len Coburn of the U.S. Department of Energy as President-elect, Arnold B. Baker of Sandia National Laboratories as the elected U.S. Regional Representative and Frits van Oostvoorn of Energy Research Institute in the Netherlands who took over the position of European Regional Representative last summer. Alex Kemp at the University of Aberdeen and Paul Tempest are appointed members, preparing the IAEE International Conference in Aberdeen 2002, and Pablo Mulas of Program Universitario de Energia UNAM in Mexico is also an appointed member. We also have two new student members meeting with Council during this year: Stine Grenaa Jensen from Denmark and Alberto Elizalde Baltierra from Mexico. All together, the 2001 Council has members from 10 different countries.

I would like to thank recent outgoing Council members Charles Spierer, David J DeAngelo, Hans Larsen (last summer), Leslie Deman, Marianne S. Kah and David Knapp for their contribution to IAEE during their time on Council

IAEE is truly an international organization with a fantastic network. We should take good care of this multi-cultural organization and develop it for further services for our members and further expansion around the globe. However, our membership have been very stable the last five years and even marginally decreased. The importance and significance of the issues that IAEE covers in combination with good products to our members should be the best platform to expand

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Editor's Note

Frits van Oostvoorn reports on a study of the effects on gas prices and trade resulting from implementation of the EU Gas Directive and presents a tentative outlook for gas prices and trade changes in Europe due to the implementation. He concludes that full competition will lead to substantial gas price reductions in the current monopolistic markets, while limited implementation would harm relatively small captive consumers in these countries.

Fereidoon Sioshansi adds a sequel to his article in the

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the membership.

It is specifically important to continually recruit new young student members from all universities dealing with energy economics. We have established a scholarship scheme for students of energy economics and two new student members will meet with the Council. The annual scholarship budget has been increased from $ 10 000 to $ 20 000 this year.

The organization's financial situation is very sound and at an all time high last year. This situation gives us the flexibility and strength to invest for further development of membership services. Last year we had valuable strategy discussions both in Sydney and Philadelphia. We are going to resume this debate at our next Council meeting in Houston. We have additional valuable input from the strategy discussions of USAEE and the discussion at the EFCEE. We should ensure a continuation of dynamic and ongoing discussion on how to further improve and strenghten the organization. The challenge is to bring these ideas together and to establish a common platform for further growth and global expansion. It is important to capture the policy implication of these discussions and implement the conclusions in the budget.

One major element is the website development. Headquarters has gotten the green light and the needed budget from the Council to significantly enhance the website including placing five years of back *Energy Journal* issues on-line. The goal is to develop the IAEE website as the major internet portal for energy economics and energy related studies.

We are all looking foreward to the 24th annual IAEE International Conference in Houston April 25-27 at Omni hotel under the leadership of conference chair emiritus John Boatwright, program chairs Marianne Kah and Les Deman as well as general conference chair Michelle Michot Foss. Five major themes have been identified for the Houston conference. These topics will be adressed in conference-wide plenaries, special luncheon programs and innovative concurrent session tracks that target oil, natural gas, power, environment and business, law and other special topics. This conference can be combined with the OTC (Offshore Technology Conference) from 30 April to 3 May.

The planning of future conferences is well under way. The 25th Annual IAEE International Conference will be in Aberdeen. Scotland from 26-29 June, 2002, at the Aberdeen Exhibition and Conference Centre and University of Aberdeen. The planning and preparation is well taken care of by Alex Kemp and Paul Tempest. The 22nd USAEE/IAEE North American Conference will take place in Vancouver, Canada 6-8 October, 2002. The 2003 IAEE International Conference will take place in Prague, Czech Republic in June. The Council invites bids for the 2004 Conference to be discussed at the Houston Meeting.

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

last issue of the *Newsletter* on the California electricity crisis, brining us up to date on what has transpired in the last three months. He notes the policy lessons learned, perhaps the most important of which is that deregulation has not caused the California problems, rather ill advised deregulation has been the culprit.

Adam Rose reports on his work on electricity disruptions associated with earthquakes, noting that except for causation, the implications of a hazard-induced or institutionally-induced interruption are similar in nature. Thus, analysis of the regional impact of an electricity service disruption and the recovery therefrom caused by a major earthquake has applicability to supply disruptions caused by other events.

Karen Schnieder and Matthew Saunders examine the impact of removing energy subsidies in developing and transition economies. Subsidies, they note, distort price signals and fail to reflect the true economic costs of supply and can lead to additional pollution. Removing subsidies will result in GDP growth in 2010 half a percent higher in the developing and transition economies and a tenth of a percent higher in the developed economies.

Leonard Hyman traces the history of the electricity industry, noting that it ran smoothly for decades thanks to predictable technology improvements. Then the technology changed and the industry did not adapt quickly enough. But competitors did with the result that the industry faces competition from technology it shunned. He suggests the industry may face more competition from new technologies.

Pieter Vander Meiren looks at the myriad of rules and regulations enacted over the last 40 years that pertain to the energy industries in Europe and reports on the Acquis Communautaire assembled by the European Foundation for Cooperation in Energy Economics.

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Future IAEE Events

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*

Newsletter Disclaimer

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

2001: An Energy Odyssey?

24th IAEE International Conference – April 25 – 27, 2001
Houston, Texas, USA – Omni 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 24th IAEE International Conference will detail current developments within the energy industry so that you come away with a better sense of energy supply, demand and price. Some of the major conference themes and topics are as follows:

Energy Business Metamorphosis
Technology Transformation – Evolution or Revolution?
Sustainable Development
New Politics and Energy
International Political Hearing: Should Government Stay Out of Energy Price Formation?

Volatile fuel prices, market restructuring, globalization, privatization and regulatory reform are having significant impacts on energy markets throughout the world. Most 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.

At this time, confirmed and/or invited speakers include the following:

Robert L. Bradley, Institute for Energy Research
Eugene P. Coyle, Eco-Economics
R. Skip Horvath, Natural Gas Supply Association
Vello Kuuskraa, Advanced Resources International
Edward Morse, Hess Energy Trading Co. LLC
R.K. Pachauri, Tata Energy Research Institute
Maxine Savitz, Honeywell
Vahan Zanoyan, Petroleum Finance Corporation
Jim Payne, Devon Energy Corp.
Hoesung Lee, Council on Energy & Environment, Korea
A. Denny Ellerman, MIT
K. Kabayashi, METI/Japan
Leonard L. Coburn, U.S. Department of Energy
Philip Verleger, The Brattle Group
John W. Jimison, Berliner, Candon & Jimison
Kevin Lindemer, CERA
Oystein Noreng, Norwegian School of Management
Marvin Zonis, Marvin Zonis + Associates, Inc.
Jerome Taylor, CATO Institute
Robert Harvey, Reliant Energy
David Teece, Univ. of California at Berkeley
Michael Grubb, Imperial College
Jean (Pogo) Davies, Conoco, Inc.

Dr. Kenneth Lay, Chairman of Enron Corp., will open the conference on April 25, with a keynote luncheon presentation. **Steve Miller**, Chairman, President & CEO, Shell Oil Company will speak at a special breakfast on Thursday, April 26 and **Shirley Neff**, Senior Economist, U.S. Senate Energy and Natural Resources Committee, will provide an overview of U.S. Energy politics and policy at a special breakfast on Friday, April 27. In addition, 18 concurrent sessions are planned to address timely topics that affect all of us specializing in the field of energy economics.

The conference will feature an opening reception in the world-renowned Wiess Energy Hall at the Houston Museum of Natural Science. On Friday afternoon, April 27, two skills sessions will be arranged on real options and electric power trading. On Saturday, April 28, there will be a special tour and program on oil history and future trends using the occasion of the Spindletop anniversary.

Houston, Texas is homebase to many worldwide energy companies and a great place to meet. Single nights at the Omni Hotel are $139.00 (contact the Omni Hotel at 713-871-8181, to make your reservations). Conference registration fees are $500.00 for IAEE members and $600.00 for non-members.

For further information on this conference, please fill out the form below and return to IAEE Headquarters.

2001: An Energy Odyssey?

24th Annual International Conference of the IAEE

Please send me further information on the subject checked below regarding the IAEE Conference.

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Gas Market Liberalisation In Europe: Outlook for Gas Prices and Trade

By Frits van Oostvoorn*

Introduction

After the energy markets have been liberalised in the USA and UK, the European electricity and gas market is also changing at a fast pace. Particularly the gas market is rapidly transforming into a competitive market. Despite the fact that forecasting is particularly difficult in a period of transformation, the ambition of this paper is to picture the driving forces behind this process of liberalisation of the European gas markets and thereafter provide a brief analysis of the expected developments of gas prices and trade in the next decade. More in particular we will focus with our tentative projections for gas prices and trade on eight major gas consuming EU Member States, namely Belgium, Austria, France, Germany, Italy, Netherlands, Spain and UK, which we consider to be mature and eligible for establishing a competitive gas market.

The structure of the paper is as follows. First, we discuss the driving forces for more competition in Europe in the last ten years. Next we sketch briefly our expectations regarding two of the main drivers, of which the development is vital for the manner in which competition will be shaped. Then we give a brief overview of some analysis with our model concerning different competitive regimes. Finally we give a brief outlook of the expected changes in gas prices and trade in the coming years for the EU Member States.

Driving Factors For Competition

Demand

After a period of moderate growth in the 1980's the demand for natural gas within the European Union has risen substantially over the past decade. Natural gas demand is said to be 'booming' all over Europe. The all-around optimism is fed by several economic and political developments. The main factors that have been restraining the use of natural gas are either no longer present or will be lifted within the foreseeable future. In 1990 the European Union removed its earlier ban on burning natural gas to generate electricity. Since 1985, natural gas prices have decreased. Until 2000 the fall in oil prices combined with the depreciation of the US$ has resulted in considerably lower end user gas prices within all European countries. The low sulphur and carbon content of natural gas compared with other fossil fuels makes it an attractive fuel from an environmental perspective. In the 90's, in the UK, the availability of highly efficient Combined Cycle Gas Turbines (CCGT) and the liberalisation of the UK electricity market have stimulated the use of gas in the power sector. It seems likely that the ongoing liberalisation of the continental European electricity market will have a similar effect on the demand for CCGT and, hence, for natural gas. The question for demand growth is; will the CCGT capacity also increase at a similar pace in the other continental European countries such as France, Germany and Italy.

Supply

Until recent years, the ownership structure on the supply side of the European gas market can be characterised as an extremely complex oligopoly. In order to limit market risk, the search for and exploration of (new) gas fields is often executed in joint ventures with other gas companies. Although the management of a single gas field usually rests with one company, all partners in the joint venture are entitled to a part of the profit (loss) of the field. Additionally, many upstream (exploration and production of natural gas) companies have extensive interests in the downstream part of the market. The ownership structure of individual transmission companies can be very complex as well. For example, a consortium of four so-called 'pools' owns Germany's Ruhrgas. Behind each of these pools stands a consortium of upstream gas companies, some of which have shares in more than one pool. In fact, so far the upstream market is the most competitive part of the natural gas chain. About twenty major companies are involved in the supply, exploration and production of natural gas for supply to the eight major consumer countries in the EU. Taking a look at each of the countries separately, we obtain a somewhat different picture. In some countries, one company or a consortium of companies holds a dominant market share. Moreover, many of the companies do not compete with each other because of geographically separated markets. Seven out of the twenty companies listed are active only, or mainly, in the United Kingdom, whereas the two largest companies, Gazprom and Sonatrach, only compete with each other in Italy so far. However, the changes in market volume and market share in recent years also illustrate the growing importance of non-EU producers, which is expected to become stronger in the near future.

Transmission

Until 1999 the downstream part of the EU gas market (transmission and distribution) shows a completely different picture than the upstream part. In nearly every country, the transmission market was and at present for some countries still is almost completely dominated by one company supplying virtually the entire market. The only exception next to the UK is the German gas market where the share of the largest transmission company, Ruhrgas, is limited to around 69 per cent. A reasonably competitive upstream market exists together with a nearly (third parties have in principle access to these grids) monopolistic downstream market. Hence, the conclusion seems warranted that any problems with market power will be mainly confined to the downstream market. However, the situation in the market for natural gas is more complicated than this simple analysis suggests. First, a number of the companies active in production and import of natural

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*Frits van Oostvoorn is with the Netherlands Energy Research Foundation - ECN in Amsterdam,,The Netherlands. This paper was presented at the 21st Annual North American Conference of the USAEE/IAEE, September 24-27 2000, in Philadelphia, Pennsylvania and is partly based on the ECN study on the 'Impacts of Market Liberalisation on the EU Gas Industry', for the European Commission - Directorate General for Energy, which was carried out in the context of the Shared Analysis Project (Volume 9) in 1999. In addition some recent model analyses have been conducted for updating and improving our views (M.G. Boots and F.A.M. Rijkers, 2000). The author gratefully thanks M.G. Boots and F.A.M. Rijkers for providing the necessary background information necessary for writing this paper.

gas are working closely together. The main motive is that it allows cost savings and reduces risk. Horizontal integration also reduces the number of competitors in the market and, hence, reduces competition. Second, many of the upstream companies have interests in downstream companies. This vertical integration reduces risk and increases value added for a company, it also allows the upstream firm to 'shift' the battlefield to the less competitive downstream market and, hence, to evade competition. Furthermore, the fall in natural gas prices since the mid-eighties has been fully absorbed by cost reductions, which are particularly realised by the producers, while at the same time, the profits of the transmission companies have remained almost unaffected. Since the new companies Gazprom, Sonatrach and GFU (a Norwegian Joint Gas Negotiations Committee composed of Statoil, Norsk Hydro and Saga) have virtually no downstream interests, they have been hit much harder by the fall in natural gas prices between 1986 and 1995 than other companies with downstream activities (v. Oostvoorn and Boots, 1999).

EU Gas Directive

Until 1990, the issue of gas market liberalisation did not feature significantly on the policy agenda of the European Commission. Its concerns were primarily focused on issues of security of supply. The gas industry was allowed to operate according to the individual wishes of each Member State. Perhaps because of the strategic importance of energy supply, no serious attempts were made to establish a free market in either gas or electricity, in spite of the EU objective of the establishment of a free market for other goods and services. However, in the 90's the European Commission reconsidered its position and adopted two important EU Directives, one on electricity (1996) and another on the gas market (1998); this to enhance the efficiency and lower the energy prices of these markets.

The EU Gas Directive aims at creating a fully competitive market in natural gas through common basic rules for transmission, distribution, supply and storage. Central to this aim is the requirement to open up the transmission network and storage facilities (third party access), so that eligible customers can buy gas directly from any/each producer if they wish. The Directive establishes minimal degrees of market opening. The initial gas market opening covers all power generators and all other consumers of more than 25 million cubic metres/year and a minimum of 20% of each national market. Finally the EC threshold for market opening is 33%, but due to reciprocity we foresee that several EU countries will end up with a 100% opening before 2005. The market opening rises to 15 million cubic metres/year and 28% of the market after five years of the Directive taking effect in 2000; and to 5 million cubic metres/year and 33% after ten years. The Directive also allows new entrants to build pipelines, etc. Clearly the Directive is a key driving factor for pushing competition in the gas markets in a majority of continental EU Member States and other European countries. It is rather important that there is free TPA, in order to ensure that accessibility on equal basis is guaranteed for all eligible companies. This process will be completed for the whole of Europe, if the CEECs that are candidate members also adopt and implement the EU Gas Directive in order to comply with the acquis communautaire.

In summary, over the past years the following factors have been driving the EU gas markets towards more competition:

- growing gas share in energy demand and diversification of gas supplies and imports,
- emergence of large non-EU suppliers and overcapacity in gas supplies to the EU consumer markets,
- changing role of governments in the economy, and consequently their intervention in the gas markets, from players to regulators,
- two important events, one the opening up of the German gas market by Wingas and Gazprom and second the liberalisation of the UK gas market and construction of the Interconnector between UK and Belgium,
- implementation of the EU Gas Directive to accomplish an internal market for gas for all Member States.

Key Drivers For The Future

In order to present a tentative outlook for gas prices and trade first we briefly discuss the main drivers in the next years. In our view and looking at the experiences elsewhere, i.e., UK and USA, the most relevant factors for growing and shaping competition in the European gas markets in the next decade are:

- implementation of the EU Gas Directive in the Member States,
- behaviour and responses of companies in the gas market inside and outside the EU.

EU Gas Directive Implementation

The future developments of the EU gas markets, the implementation of the Directive raises several questions. How will the different Member States implement the Gas Directive and at what pace? Given the large differences between Member States with respect to available domestic gas production, dependency on imports and other economic and political features, differences in the implementation can be expected. Will the implementation of the Directive indeed lead to an internal market for gas in the EU or in other words, will the Directive be implemented by all Member States beyond its minimal requirements? And will this lead to sufficient investments in gas transmission grids and thus an enlargement of the European gas network, which is sufficiently capable to allow for emergence of full competition in the European gas market. How will the Member States and how will the Commission react to mergers or vertical integration of companies and to requests for derogations and violations of what is expected by the Gas Directive?

Below we sketch an optimistic outlook with respect the accomplishment of fully competitive gas markets. This implies a close approximation of the 'full competition' status of the gas market, in at least eight mature Member States before the year 2008. Meaning that for these mature gas markets in the EU the objectives of the EU Directive, namely establishment of an internal gas market, are completely fulfilled in 2008.

We conclude that in order to bring about a fully liberalised gas market in the EU and thereby harvesting the expected benefits, such as a more efficient gas industry and gas price reductions for all customers, the following market conditions must prevail in 2008:

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European Gas Market Liberalisation (continued from page 5)

- Harmonisation of the implementation of the Gas Directive in all EU Member States beyond the bottom-line requirements. This implies among other things an effective and thus legal unbundling of accounts and separation of management of the different functions of the gas market such as trade, network transmission, storage, etc. Otherwise large vertically integrated and/ or national gas companies will continue to dominate the gas markets in the EU. However, the companies involved in unbundling will on the short run face higher exploitation costs so the industry will have a smaller margin as the prices fall. Furthermore, it implies a 100% opening up of the market instead of 33%.
- Effective and non-discriminatory access to the entire network and particularly its auxiliary functions such as storage facilities and services. This can only be attained by regulated TPA for the entire network.
- Establishment of a strongly empowered regulation authorities at the EU and Member State level, which have to co-ordinate with each other and the Commission their pro-active regulatory work in order to be really effective in facilitating trade and non-discriminatory access of all parties involved.
- Minimise derogations for mature markets, particularly for take-or-pay contracts, public service obligations and capacity reasons.
- Close monitoring of events and market developments by policy makers at both EU and Member State level.
- Sufficient and timely extension of pipelines, network, hubs and other trading (storage!) facilities and emergence of spot and future trading at the interconnections (hubs on geographical optimal locations).

Above we sketched an optimistic view of the future. However, there are a few market developments that can easily undermine this optimistic view. This mainly concerns the degree of market opening and company behaviour, particularly in the downstream gas market. In reality, the progress and process of implementing the Gas Directive is currently diverse among the different Member States. Some of the Member States opt for a more restricted opening up of markets and thereby limit the scope for switching suppliers by customers in the next years. We observe a different pace, progress and direction of implementation of the Directive in several Member States. For example, it seems doubtful that France, Belgium and Italy will be completely (100%) opened up in 2008 like the UK today. Consequently, the share of eligible customers (potentially) able to switch suppliers differs strongly among the Member States. Probably the French government sticks to the 33% opening in their new regulation. In Italy the new law is strongly in favour of the incumbent gas company ENI, which maintains its near monopoly on storage and national supplies and in Belgium Distrigaz will also maintain its dominant position.

Clearly one of the most relevant parts regarding the implementation of the Directive for pushing competition and downward pressure on gas prices in the Member States and thus Europe-wide, is the Directive principle of non-discriminatory (in economic terms) access to all transmission pipelines in Europe by suppliers, traders and distribution companies. Thus for the gas prices to customers, it is also important how some key elements of open access in the Member States are realised. Particularly important for non-discriminatory access is:

- What type of TPA, negotiated or regulated, will be implemented and in what way,
- The costs of access to the pipelines and auxiliary services,
- What methods and schemes for calculation and determining the tariffs and pricing of the services will be applied?

Concluding, at the moment, the outlook for the implementation of the Directive leads to the tentative conclusion that:

- a majority of countries opt for negotiated TPA, and unfortunately some are adopting it in a weak form,
- costs of access to transmission networks differ among countries,
- tariff schemes also differ between the network operators of the Member States,
- harmonisation of access conditions between the Member States is still lacking,
- several Member States are planning (by law) a 100% opening up, but others such as France stick to a minimum obligation of 33%.

Clearly the lack of harmonisation poses a great threat to cross-the-border trade and, therefore, the establishment of competitive European gas markets.

Company Responses

What are the responses of the different gas companies to the implementation of the Directive by the Member States? For example, can we expect a defensive (i.e., wait and see) or offensive (i.e., take-overs, mergers, etc.) response of the companies? What will be the most significant responses of the gas industry regarding gas pricing and trade and will they seize the new trading opportunities. The main drive for upstream companies is to get more and more engaged with sales in the retail markets, if necessary by becoming vertically integrated companies via mergers or expanding their current activities by forming alliances with downstream transport oriented gas companies. Mergers are a daily topic within the European continent now. Clearly the upstream competition between large producing companies will very probably continue in the next decade and the number of interconnections between regional networks will gradually increase in the future. Furthermore, the role of existing and new supply companies in the upstream market and the role of transmission and trade companies in the downstream market is vital. For example, existing national transmission companies might succeed in holding on to their near monopoly powers and might successfully keep new traders out of the distribution networks. Merges or alliances might also limit competition in upstream and downstream markets. Vertical integration for producers via merging with downstream companies is an attractive option for keeping their profits intact. In any case, increasing downstream competition is crucial for enhancing the scope for downward pressure on gas prices. Furthermore, the companies involved in unbundling will on the short run face higher exploitation costs, temporarily leading to a smaller margin for these companies as the gas prices will fall.

The above mentioned factors can keep gas prices for consumers above levels attainable in well-functioning competitive markets. However, there are also other cost factors that have a similar or additional impact, i.e.,:

- Take or Pay obligation of gas contracted before 2000 and without adaptation mechanisms,
- Cost of load balancing,
- Investments in expansion of (long distance) transmission, storage, metering and quality conversion facilities.

Particularly in Member States, which are slow or minimally interested to introduce full competition conditions, the required investments in trade facilities and other market functions such as spot and future trade will probably be absent and thus the scope for minimising the above cost factors is minimal. This could result in fragmentised 'regions' of competition within Europe, which would lead to an unstable business environment. Consequently there will be certain reservations towards investments in storage and new supply areas. Second and if the gas prices will fall temporarily it will give a rolled back impact on the producers and this will also result in a cut back of investments and large volatility of gas prices.

Generally, liberalisation will lead to pressure on ToP contracts. There will be more short-term contracts and SPOT gas, which results in a short-term-market behaviour of companies. However, if not dealt with properly, i.e., by introducing 'future trade' and other market trade mechanisms, this will finally also result in lower security of supply in these not fully opened up gas markets, less cross border trade, less development in 'fuel of choice' and thus less decreasing gas prices than would otherwise be possible. Of course, this fragmentation of the gas market, which is not intended by the EU, is very harmful for consumers and an efficient evolution of the European gas market.

In summary, we conclude that probably full competition conditions will not be met in three or four of the EU countries, i.e., France, Belgium, Austria and Italy, before 2008, because they are not opened up 100%, thus switching of suppliers is limited and large (national) transmission companies are still able to exercise a 'near' monopolistic behaviour to protect their profit levels.

Analysis of Different Forms of Competition

Clearly, the implementation of the Directive and the company responses are the key drivers for more competition in coming years. However, the precise outcomes of the progressive liberalisation of the EU gas market are, as yet, very uncertain, because the developments of these key drivers are very uncertain and part of a dynamic process in the next five to ten years; a dynamic process, in which both the gas companies and regulatory rules play a key role. To illustrate clearly the importance of these two factors for the changes in gas price and trade patterns ECN has conducted several studies with its gas model GASTALE[1] to examine the effects of different forms of competitive behaviour of downstream transmission (trade) companies. Four alternative assumptions on the market behaviour were analysed. First, we either assume perfect competitive behaviour or oligopolistic behaviour for the traders. Secondly, the border prices are either constrained to be equal across market segments and traders within a country or they are not constrained. The latter situation essentially represents the possibility of price discrimination by the producers. If price discrimination on the border prices is allowed in the model, it means that producers can transfer price decreases from small consumers (households) to large consumers (industries and power generators). Moreover, if producers apply price discrimination, the margin that can be set by traders in an oligopoly on the end-use prices for the small consumers will be reduced considerably. The four alternatives are denoted as case PC-ND, PC-D, O-ND and O-D, see below. PC-ND represents the most competitive downstream case and O-D the least competitive.

	No price discrimination	Price discrimination
Perfect competition	PC-ND	PC-D
Oligopoly	O-ND	O-D

All other things are held equal across these four cases. Upstream producers are assumed to exhibit oligopolistic behaviour. The number of downstream transmission companies is fixed. It is assumed that all consumers, i.e., gas-fired power generators, industrial gas consumers and households, are free to contract for their gas supply. Thus, all consumer markets are assumed eligible (100% market opening).

The results in Table 1 show that assumptions regarding the behaviour of downstream transmission traders can have a large effect on prices. An oligopolistic downstream structure results in higher end-use prices than perfect competitive traders' market. In an oligopoly, traders exhibit market power, resulting in prices being higher and quantities of gas sales being lower than with perfect competition, which means that consumption and production in an oligopoly is lower than in a perfect competitive market. Traders make no profit under perfect competition; all profits accrue to the upstream producers. Consequently, total producers' profits are higher in perfect competitive traders' market[2]. In perfect competitive traders' market, the division in market shares between two (or more) traders in the same country (in this case Ruhrgas and Wingas in Germany) is irrelevant as they make no profit (and no losses). In an oligopolistic structure, market share is relevant regarding the optimal solution. As expected, price discrimination results in a wider gap between prices for small consumers (households) and large consumers (industries and power generation.

Thus price discrimination will especially be advantageous for large gas users at the expense of households. As price discrimination is simulated at the country border, the profits of price discrimination solely flow to the upstream producers. Subsequently, the profits of the traders are reduced as the margin they could charge on the end-use prices decreases. In fact, the possible margin on household prices is to a large extent transferred from the traders to the producers. Comparing

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[1] See footnotes at end of text.

European Gas Market Liberalisation (continued from page 7)

prices in cases O-ND and O-D shows that traders are indeed better off without price discrimination.

Also the case of limited market opening in a small number of selected countries (Austria, Belgium, France and Italy) was analysed. It was assumed that households in those countries will stay captive. For these captive markets the expected 2008 consumption is taken as given (IEA, 1998b). This was compared with a situation of complete opening, assuming that all consumer groups are eligible to choose their natural gas supplier. Here, expected consumption in 2008 is only used to calculate exogenous production.

At the demand side, prices and volumes of natural gas consumption are the important indicators for the effects of market opening. The resulting prices did show that incomplete market opening, compared to the base case of 1995, is advantageous for the consumers that stay captive. The gas price decline for households in Austria, Belgium, France and Italy are substantial in that case. In most cases, prices for industries and power generation increase as a result of market opening. Apparently, initial prices (1995) for large consumers in the countries concerned were too low when compared to the prices for households, due to heavy cross-subsidisation by national transmission companies.

Table 1

Resulting end-use prices (1995 US$/1000 m^3) and profits (1995 10^6 US$) for cases PC-ND, PC-D, O-ND and O-D

		Perfect competition		Oligopoly	
		No discr.	Discr.	No discr.	Discr.
Country	Sector	PC-ND	PC-D	O-ND	O-D
Austria	households	190	363	414	500
	industries	178	154	204	192
	generation	176	153	203	191
Belgium	households	139	373	397	510
	industries	127	124	148	141
	generation	125	102	125	108
France	households	195	408	459	562
	industries	183	154	206	188
	generation	180	129	180	151
Germany	households	200	355	332	436
	industries	188	160	198	179
	generation	186	138	183	151
Italy	households	193	540	576	745
	industries	177	183	219	217
	generation	172	136	172	150
Netherlands	households	192	324	372	438
	industries	188	147	194	174
	generation	188	145	193	172
Spain	households	117	366	372	494
	industries	117	125	131	133
	generation	117	111	117	111
UK	households	133	272	292	357
	industries	133	134	155	151
	generation	133	112	133	118
Profits	Producers	34172	56298	22028	33489
	Traders	0	0	29744	12944
	Total	34172	56298	51773	46433

Finally, the impact of changes in the number of traders active in the downstream market was analysed. Assuming an oligopolistic downstream structure, we saw that end-use prices converge to prices corresponding with perfect competition when the number of traders increased. When a large number of traders is active on the same market, the competition becomes stronger and traders lower their prices in order to retain their market share. Although it is often thought that vertical integration stimulates market power of producers/ suppliers and puts the end-consumer into an unfavourable position, the opposite might be true. Given the oligopolistic structure of the upstream industry, it is of great importance to prevent (or abolish) monopolistic structures in the downstream gas market. Tirole already stated 'What is worse than a monopoly? A chain of monopolies'.

In summary, besides the effects of incomplete opening versus complete opening, the results also indicate that the traders behaviour make quite a difference for the end-user's gas price. Price differences compared to the base case are generally stronger in the oligopolistic cases than in the perfect competitive cases. Moreover, price reactions are sometimes opposite; in the perfect competitive cases, prices decline more often. Both conclusions are a logical result of the current institutional structures of the gas markets in most of the Member States. Although these markets are often dominated by a monopoly, the markets are strongly regulated by national authorities, who succeed in maintaining end-use prices close to the marginal cost in the past.

Expectations

Prices Between 2005 - 2008

In summary, under ideal circumstances of achieving full competition the upstream gas market will still be characterised by oligopolistic behaviour of the major gas supply companies on the wholesale market. But oversupplies guarantee probably sufficient competition in the upstream markets in the next ten years. However, in general the gas markets of the eight 'mature' Member States can expect substantial gas price reductions for end-users from liberalisation, in particular if fragmentation of the internal market is avoided and the number of downstream companies is not limited to the incumbent companies. Subsequently, the profits of trade companies will be squeezed in the next years.

In the Member States where we expect a limited market opening, cross border trade and switching of (eligible) customers will be limited, profits will remain relatively high in the transmission part of the gas supply chain to the customer. Consequently it is expected that most of the gas price reductions will be given to industrial and power companies (end users) under competition pressure. However, this will be at the expense of the more smaller customers in these four EU Member States, in order to keep the overall transmission profits constant.

Simulating the emergence of new traders active in the downstream market, challenging the 'former' national near monopoly traders in the other Member States. This will create a downward pressure on consumer prices. Although it is not explicitly analysed here, economic literature (Tirole, 1988) concludes that in the case of both upstream and downstream oligopolies, vertical integration between upstream and downstream might be favourable for the consumers, because vertical integration prevents double marginalisation, i.e., creation of two successive mark-ups, and, therefore, the end-use prices will be lower. At the same time, profits of the vertically integrated company are higher than the sum of profits of the non-integrated companies. This suggests that in the case where monopolistic or oligopolistic competition between downstream gas companies cannot be prevented, allowing for vertical integration could provide a sensible alternative in Europe.

Changes in the Market Structure

We expect the following changes in trade patterns if gas markets in Europe approach full competition between 2005-2008:

- The share of trade via the pipeline network for transmission will decline and be substituted by volumes of swap deals and other 'paper trade', thereby reducing the transmission costs for consumers. This is because transmission and other auxiliary (storage, quality, etc.) costs are becoming relatively more important in determining the end use gas price in a fully competitive market.
- Consequently EU producers such as Shell, Exxon, Agip/ENI, Winter-shall, etc., which are located closer to their customer markets than most of the non-EU producers, are the 'winners' in the next decade, if attaining a full competition gas market. Their production and trade will increase relatively more than the non-EU producers in the next five or more years.
- Mergers between traditionally upstream competing producers and (national) transmission (trade) and distribution companies can be expected. This trend for vertical integration can lead to price wars at the retail market and thus price reductions and volatility of prices.
- Regions of full competition in Europe will lead to a fragmented 'internal gas market' in Europe and thereby hampering cross border trade and really full competition in the EU.
- The current upstream gas oversupply situation will continue in the next 10 years. However, after about 10 years, more expensive so-called non-EU 'long distance' gas supplies might be necessary to meet the growing EU and CEEC gas demand (assuming reasonable economic growth figures and decoupling of oil and gas prices in Europe). This might lead to small price rises at the EU border and perhaps also too small increases in end user prices. This only holds if the production costs of the EU producers rise even more.
- The relative market positions of Russia and Norway will only gradually change in medium term, in favour of the lowest cost and most reliable producer of these two. Particularly in the EU, Russia's Gazprom will try to expand its market share at the expense of Statoil, if the political situation in Eastern Europe does not change dramatically, and given their strong need for hard currency export revenues. However, changing alliances and development of 'new alliances' between non-EU producers and EU trading companies (vertical integration to reach profitable consumer markets) might change this perspective substantially.
- In the downstream markets, 'product differentiation' will increase. The exact form of this differentiation is still an open question. However, recent mergers of utilities suggest a trend towards the emergence of so-called multi-utilities, which are supplying a package consisting of electricity, gas, water and cable services to consumers.

Footnotes

[1] The model GASTALE describes the European gas market in terms of two layers of companies that are active on the supply side and consumers that are active on the demand side of the market. It includes sixteen producing companies, a number of transmission companies and three consumer categories per country. It assumes oligopolistic behaviour of supply companies in the wholesale market and can analyse different behaviour of transmission companies in the retail market (Boots, 2000).

[2] Remember that the producers are assumed to form an oligopoly.

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California's Electricity Crisis Continues

By Fereidoon P. Sioshansi*

The Golden State's electricity crisis, which began in earnest last May, continued to take turns for the worst. For the first time in recent memory, there were rolling blackouts in January, normally a low-demand period. The state's two investor-owned utilities became technically insolvent as they defaulted on payments that became due. The state's politicians, who had been indecisive for months, could no longer ignore the seriousness of the problem. An article in the last issue of this newsletter described the situation. This is a sequel.

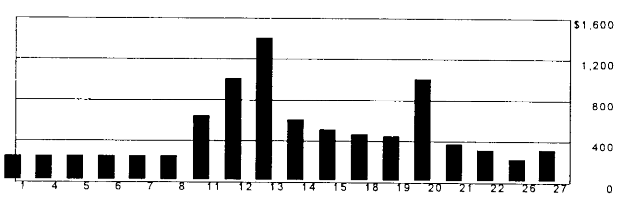
First Signs of Trouble

As early as spring of 2000, there were ample signs that it was going to be a rough summer. California's Independent System Operator (ISO) began to warn that a hot summer could spell disaster for California's over-stretched electricity infrastructure.

The summer was not unusually hot, but hot enough to push wholesale electricity prices out of sight. Severe capacity shortages meant that the independent generators, who now supply the bulk of power in the state, could demand exorbitant prices, and get away with it. Prices at the Power Exchange's (PX) Day-Ahead auction reached unprecedented levels, and have stayed high ever since, as the figure below shows for the month of December, normally a low-demand period.

Out of Sight, But Not Out of Mind

Daily Average Peak Wholesale Electricity Prices in California's Day-Ahead Market



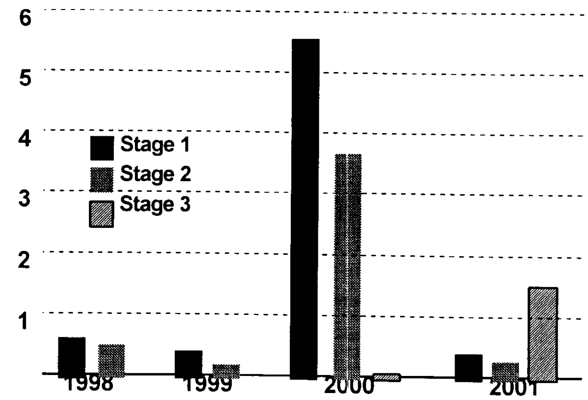
Source: California Power Exchange

As if this were not bad enough, the ISO has been paying equally exorbitant prices in the real-time market for ancillary services (AS), which are needed to maintain the system's reliability. Generators had learned that they could make more money by withholding some of their generation from the PX auction, and by bidding into the real-time AS market. Under the rules of the market, it was perfectly legal.

As shocking as these prices were, they could be rationalized by the fact that the state was operating with virtually no spare reserve margin. For days on end, the ISO has been managing a system running on the verge of collapse. As shown in the accompanying graph, California has experienced far too many Stage 1, 2, and 3 alerts than most people would like to remember. Since December 2000, it has become a daily routine – the only question is which stage we're in. During a two week period in January, the system was continuously on Stage 3 alert.

Running on Empty – Day After Awful Day

Number of Stage 1, 2, and 3 Alerts* Declared by Cal ISO



* Stage 1 alert is declared when demand reaches within 7% of available capacity under ISO's control; 5% for Stage 2; 1.5% for Stage 3, the most serious

Source: California ISO, as of late January 2001

By mid-summer, the crisis could no longer be ignored, particularly in San Diego where the local utility was passing on the higher wholesale electricity costs directly to customers. Still, the politicians did not take decisive action. Instead, they launched a number of inquiries in search of the guilty parties and began a protracted game of finger pointing. The confusion about who was to blame, and who was responsible to fix the problem, did not help matters either. The ensuing friction between the state and federal regulators became noticeably counter-productive, as state officials waited for the Feds to act, and vice versa.

Easy Fixes Don't Solve the Problem

Instead of focusing on the fundamental – but painful – solutions (e.g., inadequate supplies, long-term, fixed price contracts), the politicians initially began to look for quick and easy fixes. For example, on three consecutive votes, they lowered the price cap on the wholesale market, from $750/MWh, to $500, to $250. But California is not an island, and electrons flow to the highest bidder. Artificial price caps may make good headlines, but do not solve the underlying problem – in this case, inadequate supplies. In the mean time, everybody was betting that with the cooler winter temperatures, and falling demand, the whole fiasco would simply go away – at least until the following summer.

Simultaneously, the utilities were accumulating debt at an alarming rate. Because the retail rates they could charge their customers were frozen by the restructuring legislation, they were unable to pass on the high cost of wholesale power at the daily PX auction (see accompanying chart). The original legislation did not allow the utilities to hedge their bets easily through long-term supply contracts, nor allowed them to bypass the state-mandated PX. This meant that they were fully exposed to price volatility in the spot market for virtually all their requirements.

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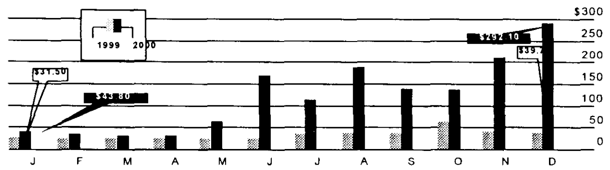
Recipe for Disaster: Rising Wholesale Prices, Frozen Retail Rates

The Average Monthly Power Bill Paid byPG&E in 1999 and 2000, $/MWh*



* Under legislation, PG&E can charge no more than $54/MWh to its customers. The picture is similar for SCE, numbers are slightly different. Source: PG&E

Betting on Cool Temperatures and Falling Prices

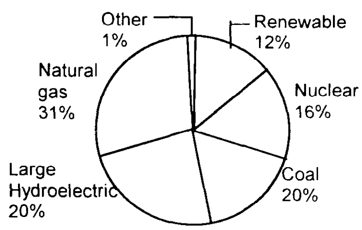
For their part, the utilities did not play their cards too well either. Even though they were under-collecting millions of dollars from their customers on a daily basis, they did not wish to alarm their lenders, shareholders, or the credit agencies that rate their bonds. They were also betting that prices would drop in the winter, allowing them to recoup their losses. They were wrong.

Starting in November, temperatures dropped - but to everyone's surprise, wholesale electricity prices did not. As a result of a highly unlikely set of events, prices remained unusually high, and the capacity crunch became even more critical.

- natural gas prices, which fuel most of the state's thermal units (see accompanying chart) surged due to unusually cold weather and scarcer supplies.
- many units were simultaneously taken out of service for scheduled maintenance and/or (in the case of nuclear units) for refueling.
- with the new price caps in effect, and the worsening financial plight of the utilities, generators increasingly looked at ways not to sell their output in the California market - for fear of not getting paid.

Where is the Juice Coming From?

Primary Source of Electricity for the Golden State



Source: California Energy Commission, 1999 data

For strategic as well as legal reasons, the independent generators would not dream of coordinating when units are taken out of service. Everybody, it seems, assumed that the fall and the winter is the right time to do this. And guess what? During days when the ISO was desperately scrambling for capacity, as much as 12,000 MW of generation - roughly one third of the state's requirements - was off line. Some skeptics believe that many units were off line because the generators did not wish to have them available, thus creating artificial scarcity and pushing prices even higher. Regardless of the causes, the net result was unprecedented high prices during months when electricity is normally plentiful and inexpensive.

What is more surprising, prices remained high during all hours - not just peak hours. One possible explanation for this unusual phenomenon? Since winter months in California are characterized by two distinct peaks in the morning and evening, most thermal units that bid into the market have to stay on during the whole day to serve both peaks. Consequently they bid the same high price for all hours. In other words, there were no off-peak hours in California market anymore.

In early December, just as people were getting ready to turn on their Christmas lights for the holidays, the ISO decided that it had had enough of the politicking, bickering and the constraining price caps. Defying the regulators, the over-stressed agency unilaterally declared that it would henceforth buy power from anybody at any price, price caps notwithstanding. But it was too late. The power shortage had become so severe that consumers were asked not to turn their decorative lights until after the peak evening hours.

More Ominous Threat: Utility Bankruptcies

But by this time (early December 2000), the crisis had reached a new and more ominous stage. High prices were no longer the issue. A much larger problem was looming over the industry: impending bankruptcy of the two giant investor-owned utilities (IOUs) in California. With some $12 billion of debt (at the time of this writing), and counting, once mighty Pacific Gas & Electric Company (PG&E) and Southern California Edison (SCE) had become poor credit risks. Suppliers no longer wanted to sell to them for fear of not getting paid. For a few tense days in early December, the lights almost went out in California. It wasn't just electricity either. Natural gas suppliers wanted cash on delivery, and the utilities did not have the cash.

Governor Davis, who had been indecisive - some would say irresponsible - up to this point finally got the message that the energy crisis was serious, and would not go away on its own. Still, he was reluctant to accept that this was primarily a California problem, that required a California solution.

Mr. Davis flew to Washington DC to confer with former President Bill Clinton, Alan Greenspan, the Treasury and the Energy Secretaries, and the former Chairman of the Federal Energy Regulatory Commission (FERC). Many observers are at a loss to explain what he expected to get out of the former president or the Chairman of the Federal Reserve System. Perhaps he was still under the illusion that the federal government would somehow magically solve California's problems. All he got was symbolic sympathy from administration officials who were packing their desks to make room for their Republican counterparts who were about to take office on 20 January.

The only person who could help was the outgoing Energy Secretary, William Richardson. He invoked a rarely used emergency power act that would essentially force suppliers to continue to sell energy to California, even if there were no assurance that they would get paid. This federal order, which was subsequently renewed several times, more than anything else has been responsible for keeping the lights on in California in December and January. At the time of this writing, the order is to expire in early February, by which time the Feds

(continued on page 12)

California's Electricity Crisis *(continued from page 11)*

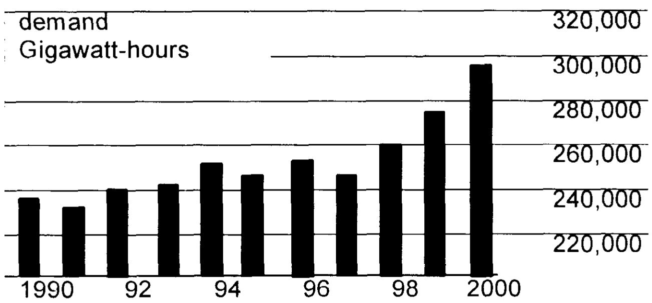
hope California has come up with a fix to its problems.

Rolling Blackouts

The climax (thus far) finally came on 17 and 18 of January when rolling blackouts could no longer be avoided. On two consecutive days, 500,000 and 2 million customers in Northern California suffered outages that lasted 90 minutes or more, many with little or no warning. Never in recent memory had the mighty Golden State been so humbled and humiliated, deprived of the most essential and critical business sustaining service, electrical power. The world's sixth largest economy had turned into a third world country, ridiculed around the world for not being able to keep the lights on during a period when demand is not even high. The state had simply run out of juice and its neighbors did not have enough to make up the difference (see accompanying chart)

Demand is Up, Investment in New Generation Capacity is Not

Electricity Generation in California, 1990-1999



Source: Cambridge Energy Research Associates

The chronic shortages of electricity began to affect other industries in ways that were hard to imagine. For example, inventories of gasoline and jet fuel hit dangerously low levels, threatening flights at major airports and supplies at petrol stations. Everyone began to realize just how serious this crisis had become. The Federal Reserve Chairman, Alan Greenspan, referred to the energy crisis in California as a major threat to the U.S. economic growth in his speech.

In the mean time, a prolonged cold spell had increased demand for natural gas. But suppliers were reluctant to sell to PG&E for the same reason that the generators did not wish to sell electricity to the California market. Even though the increased cost of natural gas could be passed on to customers, suppliers were reluctant to deal with a company on the verge of going bankrupt. They demanded cash on delivery, or else.

The beleaguered utilities were pleading to the state officials that they be relieved of their traditional obligation to serve customers. The California Public Utilities Commission (CPUC) in a comical emergency session voted on a restraining order that would force utilities to continue to serve the customers - even though it was hugely unprofitable to do so.

End of the Beginning?

At the time of this writing in late January, the situation in California is far from settled, the problems far from resolved. The Governor and the state legislators, however, have finally come to the realization that they must act, and act now. Among the steps being taken:

- An Internet-based auction to secure long-term supply contracts at fixed prices is expected to help alleviate the short-term high prices.
- The state's Department of Water Resources is expected to buy as much as one-third of the state's requirements and resell to the utilities.
- New bonds are expected to be issued by the state to help write-off some of the $12 billion of debt accumulated by the two investor-owned utilities. The bonds are likely to be paid off through a surcharge on utility bills over 10 years, making it relatively painless on consumers.
- The licensing and siting of new power plants are to be accelerated - a sorely needed remedy that will, unfortunately, not help in the next year or two.

Policy Lessons: Many Ways to Get it Wrong

The fiasco in California has had two major consequences; one positive, one not so:

- First, policy makers and regulators in other countries and states now have a model of how things may go wrong - and their disastrous consequences - if you don't design the new market rules properly. This is a hugely positive contribution - offered at great expense to California's consumers and utilities who are now experiencing the serious negative consequences.
- Second, the world-wide momentum towards liberalizing electricity markets has come to a screeching halt in many places as regulators take a time out to see if similar things are likely to happen to them. In the process, deregulation has become a dirty word. This, in our opinion, is unfortunate.

In the United States, for example, several states have now delayed the opening of their own markets pending a review of the lessons from California. These include neighboring Nevada, and the western states of Minnesota and New Mexico, but also states geographically removed including Arkansas, Oklahoma, and North Carolina.

Jeffrey Skilling, President of Enron, who is soon to become CEO, told reporters recently that "California had only itself to blame for runaway wholesale electricity prices." He went on to say that, "You probably couldn't have designed a worse system." Commenting on the so-called deregulated market in California he said, "So they say that they deregulated that market. That's just nonsense. It's probably a more regulated market today than any other market in the U.S."

More importantly, many states have taken special measures to avoid some of the problems that have plagued California. For example, politicians in Texas, which is proceeding with its own competitive market later this year, feel that their system is not likely to experience the problems of the Golden State. Others like Wisconsin, are working on beefing up their transmission network to avoid the bottlenecks that plague California. Many overseas countries send delegations to California to see the problems first hand. Few are thanking the state for providing so many useful lessons to take home.

As far as deregulation becoming a dirty word, this is unfortunate and undeserved. Enron's Skilling summed our own sentiment nicely when he said, "People are saying that deregulation causes problems. No. Stupid deregulation causes problems."

A Critical Issue in Electricity Reliability: Minimizing Regional Economic Losses in the Short Run

By Adam Rose*

Introduction

Since the New York City blackout of 1965, the primary focus of electricity service reliability has been on engineering failures in both small and integrated systems. The recent problems with the electric utility industry in California and elsewhere have dramatized three other issues of service reliability. First, is a lack of capacity for power supply in general to meet customer needs under normal engineering operating conditions. Second, is the problem of having adequate supplies but at exorbitant prices. Third, is the broader negative impact of supply interruptions and related industry problems such as utility bankruptcies.

Below, I focus on several aspects of the third issue, though aspects of the other two come into play. I pass no judgment on the causes of the current California crisis, though an underlying premise of my discussion is that similar situations are likely to develop elsewhere if deregulation proceeds without adequate safeguards. I should also note that much of my insight into the problem comes from what might first seem like a specialized area of the reliability issue, but one which I believe has applicability—the regional economic impact of an electricity service disruption caused by a major earthquake. Except for causation, the implications of a hazard-induced or an institutionally-induced service disruption are similar in nature, as are some of the policy measures to cope with them. In short, both types of events cause ripple or general equilibrium effects whose sum can be a large multiple of the direct profit losses or direct customer sales losses. Also similar are the application of interruptible service discounts or various other mechanisms for rationing electricity services made even more scarce by the adverse situation.[1]

A Broader Perspective on Loss Estimation

Industrial economies are characterized by a high level of economic interdependence, where negative impacts in one sector set off a chain-reaction affecting sales of suppliers and customers, as well as still further losses through decreases in wages and profits and subsequent declines in household spending. In the aftermath of a short electricity disruption, some of these can be made up by overtime work (though at a higher cost), but several sectors, such as hotels, restaurants, and some internet services, cannot do so. The loss of electricity supply can also cause physical damage or high re-start costs that decrease productivity. The irony is that not just those who are without power are affected. Also suffering losses will be businesses physically unscathed and having adequate electricity, but whose suppliers are unable to deliver a critical input or whose customers cancel their orders, anywhere along the supply/demand chain, including many steps removed.

Fortunately, businesses have a number of coping measures that have improved their "resiliency," such as back-up generators, inventories of other critical inputs (electricity is notorious because of its lack of storability), and conservation. Also, a rearrangement of contracting is viable for outages lasting several days, though either impossible or not viable for short blackouts/brownouts associated with the current California crisis. Otherwise, ordinary multiplier effects are likely to be at a maximum here and can accelerate if a key industry, e.g., petroleum refining, is disrupted at a much higher level than others, thereby creating a supply bottleneck. Business failure of a large utility can set off a similar larger than normal shock wave.

Such broader damages to the economy are typically not assessed in evaluating reliability from the perspective of the individual customer or even the system. Losses are much greater than a drop in sales of the utility company or lost production of businesses directly affected. Thus, many of the current estimates of the economic impact of the California electricity crisis are probably far too low. Broader implications are often brushed aside because many believe they are difficult to quantify (which they are not) or subject to exaggeration (they often are, but safeguards exist). The point is that economic damage from an electricity service disruption is much larger than usually measured and hence warrants greater attention to its mitigation before and during the event.

Improved Allocation of Scare Electricity Services

The best long-term solution, of course, is to make sure adequate capacity exists in the system itself or to improve the interaction of larger regional grids to make use of excess capacity elsewhere. Increased capacity comes at a cost, however, and efficiency is best served when it is not standing idle for much of the day. Thus, instruments like time-of-use metering are a valuable supplement to the long-run solution of the problem.

In the meantime, mechanisms exist for promoting the best allocation of scarce electricity. One approach is interruptible service discounts (or non-interruptible service premia). The problem comes in estimating these accurately. Most businesses have very limited experience with actual disruptions and can often make only guesses at what continued service is worth. Also, business conditions change momentarily, and these premia, which would ideally reflect the avoidance of marginal damages from an interruption, remain fixed for long periods. Still, there is a problem in that individual businesses will fail to take into account broader implications of their decisions concerning service interruptibility. However, overcoming the "partial equilibrium" optimizing problem may not be sufficient. For example, a firm may pay the premium but still be forced to shut down if one of its suppliers decides not to pay it. It is not clear that the market can incorporate all these features, especially given the lack of experience and lack of accurate "real time" information. (Of course, angry phone calls from customers to suppliers following recent events will stimulate

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[1] I have been fortunate to have received funding from the U.S. National Science Foundation to study the economic impacts of the actual Northridge earthquake of 1994 (Rose et al., 1997a), from the Multidisciplinary Center for Earthquake Engineering Research to study a hypothetical New Madrid (Memphis, Tennessee) earthquake (Rose et al., 1997b; Shinozuka et al., 1998; Rose, 1999; Rose and Benavides, 1999), and to assist in the development of the Federal Emergency Management Agency's design of an expert system for earthquake impact analysis (FEMA, 1997; Brookshire et al., 1997).

some rethinking of this, including the possibility of side-payments to better approximate an economy-wide efficient use of electricity. Ordinary breach-of-contract provisions may not be sufficient because of *force majure* exclusions.)

What is needed in accurately estimating non-interruptibility premia is an assessment of the contribution to the entire economy, a type of "general equilibrium" solution. Here energy economists have the modeling capability to provide the necessary information that may not be available to individual firms.

Pricing is almost universally supported by economists as the best rationing device for scarce resources, but two problems, from opposite extremes, arise in its application to the current context. The first, pertaining to the California case, is that retail electricity prices may be capped by law and cannot provide this support function. The other is when retail prices go through the roof or are highly volatile, causing an unsettling set of adjustment problems, cost-push inflation, and concerns about the ability of low income families to heat their homes. Almost any shortage can be eliminated if we let price go high enough, but that solution does have its down-sides.

An alternative when prices are actually capped or where there is some concern that the market equilibrium will make them go far too high is to use some form of non-market rationing, the best example of which is surrogate market pricing with some forced demand shifts. Unlike the case of earthquakes, where there is some physical damage to the electricity system that decreases flexibility (e.g., cessation of operation of a large power plant or large transmission line), the necessary infrastructure is in place in this context. The same on-off switching that works for individual customers to implement the standard interruptibility option can be used to make other selections in emergencies. Where this technical capability does not exist, it can be accomplished by decree, through announcements of shutdowns for certain customer classes. Preferably, this prioritization of customers would not be done arbitrarily, but based on market considerations (even shadow prices). Of course, such prioritization of customers is likely to be a highly politically-charged issue. However, it cannot be avoided. Even the across-the-board approach typically used is a type of default prioritization. In other cases, utilities or their regulators have a prioritization, which they often keep under wraps, for emergencies such as natural disasters.

Serious consideration should be given to economic criteria for allocating scarce electricity resources, but again not on a partial equilibrium basis. What should be assessed is a customer's contribution to the overall economy both directly and indirectly. This favors customers who have the highest total employment or sales value contribution to the economy per dollar of electricity utilized. Service sectors typically score high on this indicator if viewed in isolation, but the gap narrows considerably once we consider the energy utilization of all their indirect input demands.

Of course, I am not suggesting that major decision-makers confine themselves solely to economics, since considerations of health and safety are likely to be paramount. Some attention to geographic and socioeconomic distributions (a form of "energy justice") are likely also to be taken into account. Again, economic models exist to assist in such policy evaluations, including the ability to handle non-economic constraints. These models can be set up to provide real-time results so gains from load-shedding are not undercut by fine-turning delays.

Conclusion

How effective might improved measures to reallocate scarce electricity be in the case of California? To the best of my knowledge, no study has been undertaken to estimate this so far. However, I can offer some insights from my own work on electricity disruptions associated with earthquakes. My NSF study of the Northridge earthquake in the Los Angles Department of Water and Power Service Area indicated that unrestricted reallocation of electricity across sectors would have reduced losses of sales and employment in the earthquake aftermath by as much as 50%. This percentage applied to the "resiliency-adjusted" simulations as well. Also, additional gains could be achieved by altering the manner in which service is restored (e.g., rather than basing it on a minimization of restoration costs narrowly defined, a prioritization of customers on the basis of energy efficiency was estimated to be able to decrease economic losses by another 10-15%). Even larger economic savings were projected for a hypothetical 7.5 magnitude earthquake in the New Madrid Earthquake Zone, where supply bottlenecks in other sectors loom large because of their geographic concentration. I should mention that all of the above estimates of regional economic losses exaggerate subsequent reallocation potential because they were done with linear models and, while they allow for input substitution by electricity resiliency measures such as inventories, back-up-generators, and some conservation of electricity, no similar adjustments are incorporated for other inputs. Recent simulations with a more flexible model framework, computable general equilibrium (CGE) analysis, further support the general conclusion on the benefits of optimal electricity allocation. They indicate that normal market adjustments, including broader input substitutions, can significantly reduce economic losses from supply curtailments. CGE model estimates tend toward a lower-bound on loss estimation since they assume an immediate return to equilibrium, which would typically not take place for more than a year. They thus exaggerate the ease of adjustment and hence the cost-savings of reallocations for short-term disruptions. Still, they indicate that for such events, where ordinary market adjustment possibilities are limited, improved non-interruptible service premia and efficient reallocations implemented by decree, on the basis of efficiency prices, can at least expedite the adjustment process for electricity and go a long way to reducing the sizeable regional economic losses that are likely occurring in the current California crisis and potentially in other states.

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The Costs of the Kyoto Protocol: A Multi-Model Evaluation

Edited by John P. Weyant
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Contents

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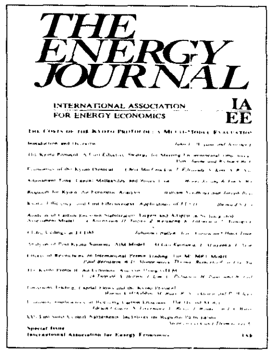

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Removing Energy Subsidies in Developing and Transition Economies

By Karen Schneider and Matthew Saunders*

Introduction

Subsidies on the production and consumption of energy are used widely by governments to achieve a range of policy objectives. Many of these are non-economic objectives and include the maintenance of regional employment levels and the provision of adequate supplies of energy to the poor. However, because subsidies distort price signals and fail to reflect the true economic costs of supply, they can lead to inefficient levels of production or consumption of the subsidised good. Fossil fuel consumption subsidies, for example, can result in overuse, inefficient use and wastage of energy. And because energy is an important source of pollution, including greenhouse gases, they can also contribute to environmental damage.

The objective in this paper is to present work in progress by ABARE on the implications of removing subsidies on the consumption of energy in the developing and transition economies. This set of subsidies has been chosen because of the important contribution these economies make to projected growth in world energy demand and to potential global environmental issues. The paper considers the impacts of subsidy removal on energy consumption, production and trade as well as on the level of greenhouse gas emissions. The analysis is based on preliminary simulation results from ABARE's Global Trade and Environment Model (GTEM).

Economic Impacts of Consumption Subsidies

Because consumption subsidies lower the price of energy, consumption of energy will expand beyond its level in the absence of subsidies. Unless the subsidy is designed to overcome a market failure this is likely to be harmful for economic efficiency. In an economy with limited resources, for example, the expansion in production that results from the increased demand following the use of consumption subsidies will occur at the expense of other more efficient industries. Equally, there are significant negative externalities in the form of environmental damage associated with the consumption of energy that are exacerbated by the impacts of subsidies.

Because of the importance of energy in the world economy, the removal of energy consumption subsidies is also likely to have significant general equilibrium effects that make it difficult to predict the impacts of reform. Issues of importance in this context are the interaction between the markets for coal, gas and oil products and other sectors of the economy. When energy prices rise following the removal of subsidies, for example, there will be impacts on the costs of production of other goods, especially energy intensive goods. Relative price changes will also affect the competitiveness of goods on world markets and may lead to changes in trade flows. Also of importance is the extent of support or protection in other parts of the economy that can hinder the efficient reallocation of resources following the removal of subsidies. All of these impacts can have important consequences for economic growth.

Measuring Energy Consumption Subsidies

Measuring energy consumption subsidies is complicated by the variety of policy instruments that governments can use to reduce the costs of an activity as well as by the often poor quality of available data. In these circumstances the most common method used is to adopt the 'price gap' approach (World Bank 1997, International Energy Agency 1999). This involves measuring the difference between the domestic price of coal and a reference or unsubsidised price level. The reference price represents the efficient price that would prevail in a market undistorted by subsidies and corresponds to the opportunity cost of the last unit of the good consumed. The approach is designed to capture the net effect of all the different policy instruments that affect a good's price.

For the purpose of this study, estimates of energy consumption subsidies based on the price gap methodology have been taken from the World Bank (Rajkumar 1996). These data have been chosen because they provide a reasonably comprehensive set of subsidies for the developing and transition economies. The subsidies are measured in 1995-96, corresponding closely with the base year in GTEM. More recent data from the International Energy Agency (International Energy Agency 1999) have also been consulted. These, however, cover fewer countries than the World Bank data and they are less compatible with the GTEM country aggregation. Nevertheless, in most cases both sets of data indicate similar energy subsidy magnitudes. A brief summary of the World Bank data is presented in Table 1. A more detailed data set giving estimates of fossil fuel subsidies by three classes of user—the power sector, industry and households—was provided directly to ABARE by the World Bank and is used in the modeling exercise.

Table 1
Subsidy rates on energy commodities, 1995-96

	Petroleum products	Gas	Coal	Total
Russia		33	47	20
Other FSU	5	62	33	44
Eastern Europe		36	26	20
China	1		11	7
India			12	1
Korea			5	
Thailand	4			4
Indonesia	12			9
Mexico		39		4
South Africa	6			4

Source: Rajkumar (1996): World Bank spreadsheet provided to ABARE.

Modeling Energy Subsidies

The analysis in this paper is based on applications of ABARE's Global Trade and Environment Model. GTEM is a

(continued on page 18)

*Karen Schneider and Matthew Saunders are with the Australian Bureau of Agricultural and Resource Economics. This is an abridged version of a paper that was presented at the 23rd Annual IAEE International Conference, Sydney, 7-10 June 2000. The full text of the paper can be obtained from the authors at the following email address: kschneider@abare.gov.au

Removing Energy Subsidies *(continued from page 17)*
multiregion, multisector, dynamic general equilibrium model of the world economy developed to address global change policy issues. It is derived from the MEGABARE model (ABARE 1996) and the GTAP model (Hertel 1997). The model code is available on ABARE's website at http// www.abareconomics.com.

GTEM is an appropriate framework for analysing complex issues such as subsidies because it takes into account the interactions between different sectors in an economy, as well as interactions between economies, and estimates the impacts of policies on key economic variables. These include the price of consumer goods and inputs into production, sectoral and regional output, trade and investment flows and, ultimately, regional income and expenditure levels. In addition, the intertemporal nature of GTEM permits the impacts of policies to be tracked over time.

GTEM also contains a sophisticated greenhouse gas emissions accounting framework. GTEM models emissions of three greenhouse gases—carbon dioxide, methane and nitrous oxides. This allows the impacts of policies such as the removal of subsidies on emissions of greenhouse gases to be tracked.

GTEM requires a reference case or a 'business as usual' simulation against which the impacts of a policy change can be measured. The reference case projects the growth in key variables in each region in the absence of any policy changes. In this paper the reference case represents the likely outlook to 2010 for world energy consumption in the absence of any policies to reduce or remove energy consumption subsidies in developing and transition economies.

The results of the policy simulation presented in this paper represent the estimated impacts on key energy variables following the removal of energy consumption subsidies in the developing and transition economies. The simulation assumes that subsidies on coal, gas and petroleum products are removed progressively over a five year period from 2001 to 2005. The impacts on variables are projected to 2010. The estimated impacts of policy changes on economic variables are defined as the percentage deviations between the equilibrium levels of those variables in the reference case and their equilibrium levels in the policy simulation.

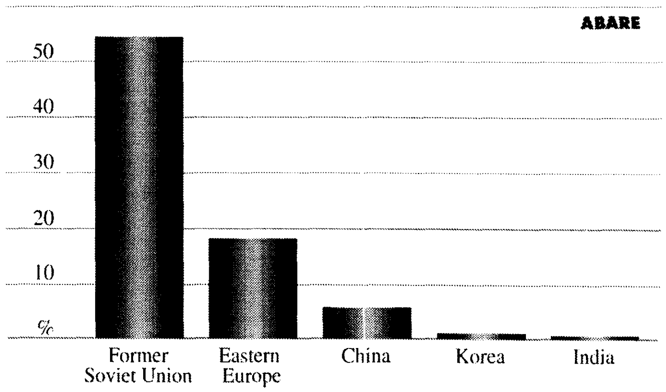
Simulation Results

When subsidies on the consumption of energy are removed there will be complex interactions within an economy, including on energy prices, consumption and trade. Because energy is a fundamental input to production processes these will be felt in the wider economy as well as by households. And because energy is widely traded, the changes that occur in energy subsidising economies will be transmitted to some extent to world markets.

Energy Price Impacts in Economies that Remove Subsidies

The simulation results show that in economies that remove subsidies, most consumer prices for energy rise relative to the reference case at 2010. The magnitude of the increase is related to the size of the subsidy. In China, for example, where subsidies on coal are moderate, average consumer coal prices are 6 percent higher at 2010 when subsidies are removed than

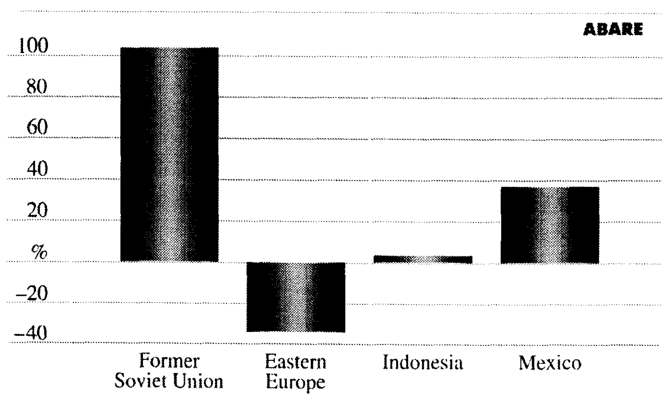
Figure 1
Change in coal prices following removal of subsidies, 2010, relative to the reference case



in the reference case (Figure 1). Coal subsidies in the former Soviet Union and eastern Europe are larger than elsewhere and, as a result, consumer price rises in these markets relative to the reference case are more significant.

A similar situation is apparent in gas markets (Figure 2). The major subsidisers of gas are the former Soviet Union and Eastern Europe, where the largest subsidies are provided to the household sector. When these are removed consumer gas prices by 2010 rise predictably in the former Soviet Union relative to the reference case but actually fall relative to the reference case in Eastern Europe. This is because the former Soviet Union diverts production from domestic to export markets as domestic consumption contracts and Eastern

Figure 2
Change in gas prices following removal of subsidies, 2010, relative to the reference case



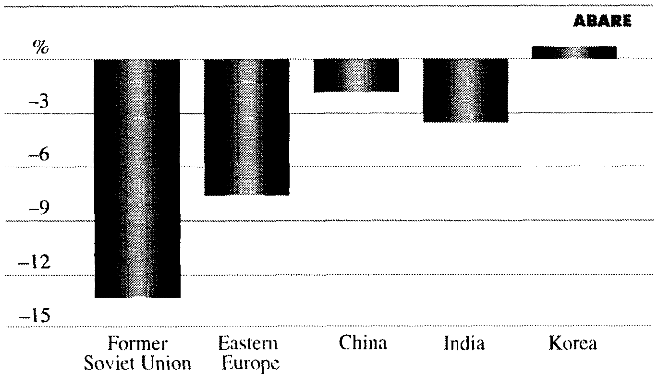
European economies are able to purchase lower priced imported gas. Mexico also provides large subsidies to gas users in all sectors and consumer gas prices rise strongly relative to the reference case after subsidy removal.

Energy Consumption Impacts

As a result of energy price rises following the removal of subsidies, energy consumption falls in most of the subsidising countries at 2010 relative to the reference case. In the former

Soviet Union, for example, coal consumption at 2010 is 13 percent below the reference case following the removal of large subsidies and the consequent significant increase in consumer coal prices (Figure 3). In Eastern Europe where

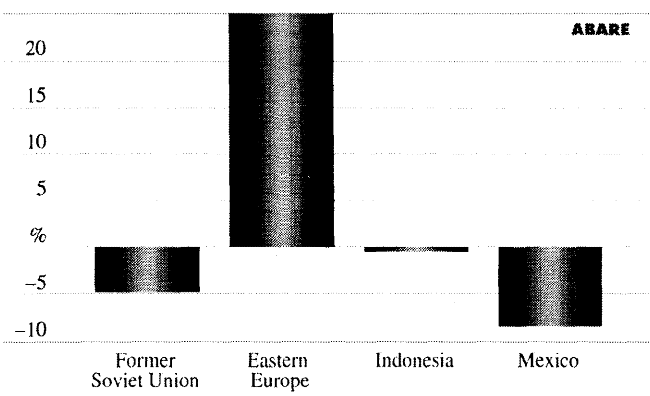
Figure 3
Change in coal consumption following removal of subsidies, 2010, relative to the reference case



coal subsidies are also high, total coal consumption at 2010 is 8 per cent below reference case levels.

In the case of gas, consumption falls relative to the reference case in all the subsidising economies following the rises in consumer prices, with the exception of Eastern Europe (Figure 4). This occurs because, as discussed above, when consumption of gas in the former Soviet Union declines, domestic production is diverted to export markets, principally Eastern Europe. The consumer price of gas is lower in the

Figure 4
Change in gas consumption following removal of subsidies, 2010, relative to the reference case



eastern European economies at 2010 than in the reference case and their demand for gas rises.

The removal of differential subsidies on a range of fuels in any one economy can also lead to strong interfuel substitution. This is especially the case in sectors such as electricity where interfuel substitution possibilities are much greater than, for example, in transport. In China, the removal of subsidies leads to some increase in the share of oil fired power generation at 2010 relative to the reference case because the subsidy on petroleum products is much lower than that on coal.

One of the major factors driving the changes in energy consumption that result from the removal of subsidies is the shift in patterns of energy intensive production. There are significant declines in energy intensive output at 2010 relative to the reference case in some economies because the increasing price of energy inputs to production increases the cost structure in these industries and reduces their competitiveness. In the case of the iron and steel industry, for example, production falls in China, Indonesia, India and South Africa relative to the reference case.

Trade and World Price Impacts

Given the changes in prices and consumption that result from subsidy removal there are consequential impacts on the domestic production of energy and on energy exports. In most cases where economies that subsidise energy consumption are also large producers of energy, there is a shift in production from domestic to export markets. This occurs because the price that producers receive from domestic consumers falls relative to the prices they can receive on export markets. On average, exports of coal from economies that remove subsidies are 20 percent higher at 2010 than their level in the reference case and exports of petroleum products are 3 percent higher. In the case of gas, exports rise significantly above reference case levels because of the impacts of gas exports from the former Soviet Union.

Increased exports of energy relative to the reference case from the economies where subsidies have been removed exert downward pressure on world energy prices. For example, the world price of coal at 2010 is 4 percent below its level in the reference case and the average world price of petroleum products is 2 percent lower. Because by far the greatest increases in exports occur in gas markets, the world price for gas falls further than for other fuels relative to the reference case.

The downward impacts on world energy prices lead to increases in energy consumption relative to the reference case in the developed economies and in other economies that do not subsidise energy consumption. For example, coal consumption in the developed economies at 2010 is 0.15 percent higher than in the reference case and petroleum products consumption rises by 0.6 percent. Gas consumption rises more strongly by 2010 relative to the reference case because of the large impacts on the world price of this fuel.

Increases in developed country energy consumption following the removal of subsidies do not completely offset the declines in the developing and transition economies. As a result, world fossil fuel consumption at 2010 is below reference case levels (Figure 5).

Impacts on Greenhouse Gas Emissions

Because the combustion of fossil fuels is the most important contributor to greenhouse gas emissions, any changes in energy consumption that arise from the removal of energy subsidies will have important consequences for world emissions. Following the decline in energy consumption in the developing economies after energy subsidies are removed, emissions in this region fall by around 1 per cent at 2010 relative to the reference case (Figure 6). Emission reductions

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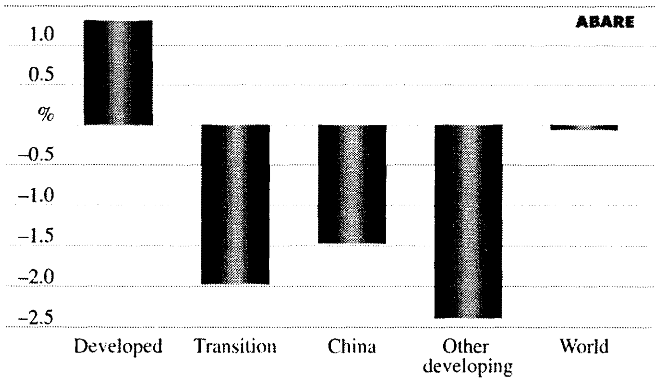
Removing Energy Subsidies *(continued from page 19)*
are much larger in the transition economies because energy

Figure 5
Change in consumption of fossil fuels following removal of subsidies, 2010, relative to the reference case



consumption falls are greater. However, in the developed economies where energy consumption rises relative to the reference case, greenhouse gas emissions at 2010 are also higher than reference case levels. The net effect at the world level is that greenhouse gas emissions at 2010 are 1.1 percent lower than they would be if subsidies remained in place.

These estimates of emission reductions are based on the simulation results only and exclude any consideration of possible greenhouse gas emission response policies in economies that are Annex B parties to the Kyoto Protocol. If Annex B parties to the protocol implemented emission reduction policies simultaneously with the removal of subsidies in other economies, the impacts on emissions could be different from those outlined above.

It should be noted that the impact on world emissions reported in this paper are considerably smaller than other research has found. The International Energy Agency, for example, estimates that following the removal of subsidies in eight large developing countries, world emissions of greenhouse gases could fall by 4.6 percent (International Energy Agency 1999). However, the nature of the analysis in the two studies is quite different with the International Energy Agency adopting a partial, single country approach to analysing energy consumption and greenhouse gas emission impacts. That is, no account is taken in that study of the potential for interfuel substitution in an economy that could reduce the impacts of subsidy removal on energy consumption and emissions. The analysis is also likely to overstate the potential reduction in emissions because it does not consider the impact of lower demand in economies that subsidise fossil fuels on world fossil fuel prices. As analysis in this paper shows, this could have a marked impact on energy consumption and greenhouse gas emissions in these economies.

Economic Impacts

Because the removal of subsidies has impacts on prices, the structure of production and trade flows, there will be consequences for economic efficiency and growth. These will extend not only to economies that subsidise energy but to others that are affected by the removal of subsidies through price and trade linkages. There will be additional benefits to economies that subsidise energy where subsidies are provided as direct transfers from government. In this case the removal of subsidies will reduce the fiscal burden and may lead to increased opportunities for growth-creating investment.

The simulation results indicate that both economies that subsidise energy consumption and other economies benefit when subsidies are removed. In the economies that remove subsidies, GDP at 2010 is almost half of a percent higher than in the reference case. In the developed economies where access to cheaper energy provides a competitive advantage, GDP rises by 0.1 percent relative to the reference case.

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From Ratebase to Revenue: The Roles of Technology and Investment in Ten Short Points

By Leonard S. Hyman*

Technology made the old electric industry. Technology unmade the old electric industry. The regulators, the industry executives, the public policy shareholders tried to put it together again. Technology will unmake their efforts, too. Here is how and why.

First Point

The electricity supply industry began as a competitive enterprise. Edison intended to compete against the entrenched city gas industry. British generator entrepreneurs built without secured markets. Electricity users could—and did—self generate. The electric companies faced the need to make heavy, long-lived capital investments. The city councils, which controlled the ability to use the streets for right-of-way, could grant franchises, rescind them, or grant competing franchises, and they did. Many cities, moreover, established their own utilities, or took over privately owned utilities. How could investors protect the value of their investments, once sunk into the ground?

Second Point

The great pioneers of the industry, Edison, Insull and Westinghouse in the United States, Merz in the UK and Rathenau in Germany thought in terms of systems. They viewed technology in the manner best described by Thomas P. Hughes, who distinguished between the technical, which encompasses "tools, machines, structures, and other devices," and the technological, which encompasses "technical . . ., economic, political, scientific, sociological, psychological, and ideological . . ."[1]

Joseph Swan, the British inventor of the light bulb, thought in technical terms. Edison thought in technological terms. He invented a system that furnished a series of services desired by society. If he had focused on the light bulb, alone, he might not have succeeded. Electric lighting cost more than gas lighting, and the gas light industry persevered in perfecting its obsolete product, reaching a new pinnacle of success with the Welsbach Mantle (invented in 1886, four years after Edison opened the Pearl Street Station).

Edison's successors grasped the importance of economies of scale, load diversity, and the universal supply system, but how could they raise the money to put their ideas in place, if newcomers could move into those markets, and if corrupt city councils could upset the business so easily? They needed protection. For that matter, how could consumers benefit from economies of scale and load diversity, if the utility could never reach scale? In the early 1900s, the investor-owned electricity industry and the states began to make deals. The state would grant the utility a monopoly, forbidding competitors from selling electricity in the franchised area. In return for the monopoly, the utility would agree to limit its profitability to a given return on its investment plus recovery of costs. If costs declined as a result of increasing economies, consumers would benefit.

Third Point

The newly devised system worked. For close to 60 years, from the inception of regulation, into the 1960s, the real price of electricity declined steadily, reflecting the increasing economies of scale, diversity of load, and the new uses of electricity encouraged, in part, by the increasing cheapness of electricity. Economists can debate whether a competitive market, instead, would have brought greater benefits to consumers. Equity investors in this regulated industry, despite its low depreciation rates and heavy reliance on debt, earned returns below or at par with those of the market, indicating, at least superficially, that the regulators did not allow the industry to earn excessive profits. At the same time, returns did seem sufficient to allow the industry to attract capital at terms fair to existing investors.[2]

Intermission

To sum up, so far, the regulated utility, operating on a rate of return base, taking advantage of increasing economies of scale, provided reliable service, served a growing proportion of the population, reduced real prices steadily, and managed to earn a level of profits that attracted capital at reasonable terms. During this period of time, investment—that is, ratebase—determined pricing. The regulator set a return on a rate base, otherwise known as cost of capital, translated that return into a given level of operating income and added, to that figure the operating expenses, to determine the revenue requirement. The regulator then estimated volume of units sold and then determined price:

RR = revenue requirement ($)
CC = cost of capital (%)
OE = operating expenses ($)
RB = rate base ($)
OI = operating income ($)
V = volume of units sold (kwh)
P = price per unit ($)

so that:

$$\frac{CC \% RB}{100} = OI$$

$$OI + OE = RR$$

$$RR = P \% V$$

And, therefore:

$$P = \frac{RR}{V}$$

Technology played a key role in facilitating growth with declining costs. The technology required heavy investment. And the industry obviously earned its cost of capital, because it had little difficulty attracting the capital. Because of the predictability of costs and volume, and because of technical improvements that may have allowed the industry to beat

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* Leonard S. Hyman is with Salomon Smith Barney. This paper was delivered at the 21st North American Conference of the USAEE/IAEE in Philadelphia, PA, September 24 to 27, 2000.

[1] See footnotes at end of text.

Ratebase to Revenue *(continued from page 21)*

expectations, regulators could easily set a price derived from the revenue requirement.

Fourth Point

In the early 1960s, conventional steam turbines reached the efficiency limits inherent in the Rankine cycle. Building bigger produced no additional benefits. As noted by Richard F. Hirsh:

> . . . a long and successful history of managing a conventional technology set the stage for the industry's deterioration in the late 1960s and 1970s. After improving steadily for decades, the technology that brought unequalled productivity growth to the industry appeared to stall, making it impossible to mitigate the difficult economic and regulatory assaults of the 1970s.[3]

The industry sought to move on to a new real energy source, nuclear power, but nuclear power plants raised rather than lowered costs. Regulators and management had difficulty in understanding that the industry had run up against a major technological barrier, that they could not run the industry as before. They could not offset unexpected inflationary cost pressures with efficiency gains. They insisted on continuing the old process. In the 15 years, 1966-1980, credit ratings collapsed and electric utility stocks not only underperformed the rest of the stock market, but they even underperformed bonds. The return on book equity exceeded the bond yield by 645 basis points in 1966 while the bond yield exceeded the return on book equity by 380 basis points in 1980. The old utility technological and finance models broke down.

Fifth Point

At the same time that conventional steam generators reached their efficiency plateau, a new technology—the gas turbine—emerged. Utility engineers, by and large, did not foresee the amazing development of this device. They stuck to the tried and true, meaning the big. Yet, E.F. Schumacher asked, in 1973:

> Methods and machine cheap enough to be accessible to virtually everyone—why should we assume that our scientists and technologists are unable to develop them?[4]

Utility engineers, however, did not take *Small is Beautiful* as their text. Thanks to a combination of mindset commitment to the completion of existing projects, and government fuel-use legislation, they let others put gas turbines into service. They missed the new technological revolution, until they woke up to discover that the gas turbines could generate electricity more cleanly and at a lower cost than the big utility plants. The gas turbine erased the rationale for a natural monopoly in generation.

Sixth Point

The Public Utility Regulatory Policies Act of 1978 (PURPA) created a new electricity generating industry that would use the gas turbine and it also created an unusual investment vehicle. The law, to some extent, permitted the PURPA generator to avoid rate of return regulation, but to set a guaranteed state-mandated price, lock the utility into a long-term contract, force the utility to take the output whether needed or not, and piggy-back onto the utility's credit rating. Other than the construction and operating risk, the PURPA generator foisted all other risks onto the utility, but the utility collected no compensation for taking those risks. This arrangement encouraged the rapid development of the new technology and the flow of investment into the independent generating industry.

Seventh Point

Two decades of independent power production, the dramatic increase in efficiencies of gas turbines, computational power and communications that permit marketers and systems operators to keep track of a multitude of transactions, and the Internet, which establishes direct contact between customer and supplier, have eroded the old utility model down to a skeleton, the wires business.

Eighth Point

Even newer technology could threaten all aspects of what was the utility business and its offshoot, the independent power business. While utilities and their affiliates concentrate on transition plans, recovery of stranded costs, centralized control functions and purchase of power stations, entrepreneurs easily raise money to develop distributed generation and internet-based enterprises that threaten the viability of the old-utility-model which now operates in the guise of a competitive industry.

Ninth Point

Competitive industries do not operate without price signals to customers. Few ultimate electricity customers receive timely price signals. Nor do users of the transmission system in many markets. People who make investment decisions to supply a one-sided market may encounter unpleasant surprises when consumers finally obtain price signals. When price rises unexpectedly, expect one of two consequences: consumers reduce consumption, which wrecks the economies of some business models, or the government regulates, which produces the same consequence. Deregulation that leads to higher prices, for more than a brief period, will not survive. Remember, the new technologies will help consumers respond to price. Investing in the now dominant technology, at high prices that reflect a continuance of that dominance may involve greater risks than now appreciated.

Tenth Point

Despite the industry's success in reclaiming stranded costs and in slowing the onset of competition, the industry has not regained its old position with investors. Since the onset of competition, the stocks have grossly underperformed the market, and in the period 1995-1999, investors withdrew over $10 billion from mutual funds that specialized in utilities while they put $37 billion into funds specializing in technology. Electric utility and independent power shares now account for an insignificant 3% or less of the market. Nobody has to own these stocks other than index funds.

Conclusion

In short, the electricity industry ran smoothly for decades, thanks to predictable technology improvements. Then the technology changed, the industry did not adapt quickly enough, but others did. Now, the industry faces competition from the technology that it shunned. It may face additional competition from new technologies. The old monopoly ended. The new monopoly may end even faster.

End Notes

[1] Thomas P. Hughes, "Technological History and Technical Problems," In Chauncey Starr and Philip C. Ritterbush, eds., *Science Technology and the Human Prospect* (New York: Pergamon Press, 1980), p. 182.

[2] For details on industry pricing and profitability and returns on investment, see Leonard S. Hyman, *America's Electric Utilities: Past, Present and Future* (Vienna, VA: Public Utilities Reports, 1997).

[3] Richard F. Hirsh, *Technology and Transformation in the American Electric Utility Industry* (Cambridge, UK: Cambridge University Press, 1969), p. ix.

[4] E.F. Schumacher, *Small is Beautiful* (New York: Harper & Row Perennial Library, 1975), p. 34.

The Jane Carter Prize

The British Institute of Energy Economics, the International Association for Energy Economics and the Association for the Conservation of Energy invite the submission of essays for the 2001 award of the Jane Carter Essay Prize. The prize will be a cash award of US $800 together with a plaque.

Essays can be on any aspect of energy efficiency and conservation or on aspects of general energy and environmental policy which are relevant to energy efficiency. The aim is to encourage new thinking on these subjects. The emphasis of the essay should, therefore, be on the policy, rather than the scientific or technical, aspects of the subject.

The competition is open to anyone under the age of thirty-five. Essays should not be more than 8,000 words long. They can be based on work done for another purpose, e.g., an academic thesis or policy report, but the results of that work should be presented in an original form. The wining essay will be considered for publication in a range of energy and environmental journals.

Essays should be submitted in English, in triplicate and typed form by 30 June 2001 to:

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

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

Book Review

Thatcherism and the Fall of Coal

By M. J. Parker, Oxford University Press for Oxford Institute for Energy Studies, ISBN 0-19-730025-1, pp. 246, 72 tables, index: £39.50 / $65 each (inc. p&p).

At the start of the 1980s UK coal mines employed over 200 thousand people, and produced over 100 million tonnes per year. By the end of the 1990s, more than 95 per cent of those jobs and 80 per cent of the output had been lost. Within a short space of time, a major British industry had all but passed into history, and as a result the entire political and industrial landscape of Britain had been irreversibly changed... What caused the fall of coal? Was it just the result of political malice from Conservative governments determined to crush the power of the National Union of Mineworkers forever? Was it due to unstoppable market forces in the energy market that made UK deep mines unviable? Or did management and unions through their mistakes create the conditions for their own destruction?

In this book Michael Parker provides an insiders account of the decline of the UK coal industry. He rejects any one simple explanation, and details how the Thatcherite political agenda, economic forces, and the industrys own performance interacted to bring about this decline; often in ways which were unforeseen by the players themselves.

The author shows how the Thatcherite political agenda to break the power of the NUM, and to turn the nationalised coal industry into a commercial enterprise, had great internal coherence. Although the outcome was not the result of any pre-ordained master plan, this agenda was implemented with considerable caution and skill (except in 1992). But the Conservative governments were also attended by good fortune, being assisted by the folly of the NUM leadership (which was a decisive factor in enabling the Government to defeat the Great Strike of 1984/5), the professionalism of British Coal in managing decline, the unforeseen way in which electricity privatisation led to the 'dash for gas', and the unpredicted severity of international trends, which reduced the real value of UK output by two-thirds.

As the author concludes, the economic fundamentals and Conservative governments' objectives pointed in the same direction. In spite of large increases in productivity and the closure of many high-cost pits, the economic pressures to reduce deep-mined output were unremitting; and with the fall in capital investment, on-going decline became inevitable. Neither massive 'down-sizing', nor the 'magic wand' of coal privatisation was able to create, even on a much-reduced scale, a sustainable and viable deep-mine industry. The consequences of this legacy were passed, in a final irony, to New Labour.

Michael J. Parker was until 1991 Director of Economics at the British Coal Corporation, and a former Chairman of the British Institute of Energy Economics. He is a graduate of Oxford University, and an Honorary Fellow of the Science Policy Research Unit at the University of Sussex. Since 1993 he has been a member of the governments Energy Advisory Panel.

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European Energy Policy and Energy Policy in Europe

By Pieter Vander Meiren*

The direct purpose of this article is to present a survey[1] of EU Energy Policy measures as they were issued over the last 40 years. Doing research on energy problems it appeared namely that these measures were scattered over a great number of official journals and not readily available in a single volume.

A first part of this article deals with energy as the object of government policy whereas a second part examines the basic principles and philosophy of E.U. policies. The third part presents the E.U. rules and regulations at present applicable in the energy sector and legally binding to member countries, present and future.

Energy as Policy Objectives

"Energy is central to economic and social activity in the industrial world. Therefore the conditions of supply, transport, distribution and consumption of energy are of interest to all."[2] Thus the introductory sentence of the E.U. Green paper in E.U. Energy Policy. In plain English this means: cut energy supplies and life comes very soon to a standstill. We revert to the era of manpower, horsepower and the whale oil lamp.

All this to stress that an efficient and adequate government energy policy aims at a reliable supply of energy at competitive prices and in environmentally acceptable conditions. This short sentence sums up the other main objectives of the energy policy, both of national and international authorities:

a a reasonable security of energy supply
b a well-functioning and free internal energy market with competitive prices
c an energy supply and consumption which respects the conditions of a sustainable healthy environment

As these objectives are to some extent mutually contradictory the real art of running a successful energy policy is to balance the different elements in a way that the end-result is acceptable both to producers and consumers.

Basic Principles of International and E.U. Energy Policy

To energy economists not familiar with the legal niceties of international and, therefore, also of the European economic treaties, European Energy Policy and Energy Policy in Europe may be largely tautological expressions. In fact, they cover quite a different content.

The European Economic Union consists (at present) of 15 sovereign countries (and in a few years up to 27 countries) which in a number of international treaties have agreed to surrender their sovereignty to international authorities on a number of mutually agreed items. This means at the same time that member-countries continue to be competent for all other items, sectors or problems for which national sovereignty has not been delegated to supra-national institutions.

Treaties of importance for the energy sector are the ECSC Treaty creating a common market for coal and steel, the Euratom Treaty and the Treaties of Maastricht, Amsterdam and recently of Nice.

The ECSC Treaty created a common market for coal and steel with common objectives and common institutions. Thus this Treaty ensures customers equal access to sources of production, encourages investments and other measures improving the productive potential of member-countries and promotes international trade of coal and steel products. On the basis of this Treaty a number of specific energy regulations have been established for the coal sector (see point D-3 of this article).

The Euratom Treaty facilitates the development of an efficient nuclear industry. Chapters of this Treaty deal with investments, indicative programmes for production, research, health protection, supplies through the Euratom Supply Agency, safeguards and safety. On the basis of this Treaty several specific rules and regulations have been established (see subsequent section of this article).

Notwithstanding the efforts of the E.U. Commission, neither the Treaty of Rome nor its subsequent amending Treaties contain a specific or special chapter relating to the energy sector. The E.U. energy policy has, therefore, to be put into place in the basis of the general provisions of these treaties and more specifically the articles referring to the establishment of the Single European Market, the rules on competition, state aid, international trade, trans-European networks, environmental protection, consumer policy and the development of trans-European networks.

In this respect the establishment of the internal market by setting common rules and the removal of barriers, whether of public or private origin as fixed by the Single European Act, is of particular importance.

On the basis of the above principles and contents of the Treaties indicated above, a series of energy-specific rules and regulations were issued by the E.U. Council of Ministers, the decision-making institution of the European Union.

Specific E.U. Energy Policy Measures

Preliminary Remarks

E.U. rules, regulation, directives, recommendations relating to the energy sector approved since the coming into force of the European Treaties are quite numerous and spread over a great number of years and issues of the E.U. official Journal which are no longer easily available. Some of the older rules were revised later on or, in view of changed circumstances, abolished or amended.

The present-day "Acquis Communautaire" in the energy sector and presented in this article was established by the European Foundation for Cooperation in Energy Economics (EFCEE). This association groups the European Affiliates of the International Association for Energy Economics (IAEE). The immediate reason for the setting up of an up-to-date publication containing all E.U. energy policy measures was the fact that the countries from Central and Eastern Europe and the Baltic region, the so-called Accession Countries, have become aspirant-members who could join the E.U. in the near future on condition that they agree to apply the "Acquis Communautaire" i.e., the body of rules and regulations thus far agreed between member countries. As also in the energy field the aspirant-members would have to subscribe the Acquis Communautaire, the EFCEE undertook to set up an up-to-date publication containing the applicable rules and regulations

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*Pieter Vander Meiren in Managing Director of the European Foundation for Cooperation in Energy Economics.

[1] See footnotes at end of text.

and to make it available to energy economists of Eastern Europe.

It was found very soon that, contrary to what we thought, a recent single inventory of E.U.-policy measures did not exist and that data had to be collected from several sources. The basic sources, the previous D.G. XVII and the Central Library of the European Commission, were very helpful.

The result was about 900 pages of text of decisions, regulations, recommendations, etc. spread over 4 volumes. As the EFCEE is a non-profit institution the "European Energy Legislation 1958-1999" is not available through commercial channels but can be obtained at cost-price by IAEE members. Companies interested in the European legislation in the energy field will find this publication indispensable as a reference book and a unique source of information.

Specific Energy Law

Before tackling the review per sector it is worthwhile to take a bird's eye view of the plethora of rules and try to classify them in a few broad categories and distil the basic philosophy which is at the basis of the legislation.

To start with the last aspect, the E.U. energy legislation reflects the time periods in which they were worked out as well as the attitude of national governments to the efforts of the Commission.

The rules applying to the coal sector are the oldest of the lot (some are more than 40 years old although several times rejuvenated). They reflect the supra-national power given to the High Authority as well as the coal problems of a few decades ago. They go into details which nowadays would probably not be politically accepted by Member states. (Think of the subsidiarity principle!).

Also the regulations pertaining to the nuclear sector show both the time image and supra-national power of the Euratom institutions. Legislation is both old and young with the accent shifting in the later years to environmental end social protection of employees (250 out of 560 pages of text in the EFCEE E.U.-Energy Legislation concern the nuclear industry).

The rules and regulations in the petroleum sector reflected definitively the oil scares of 1973 and early eighties: security of supply is the main theme of the adopted measures. Later on, under the influence of the rising interest for the environment policy, the focus shifted and attention turned to topics such as lead and sulphur contents in oil, etc.

The difficult labour of the rules and regulations in the gas and electricity sector confirms the political views of the growing number of Member states (each with its own economic interests and own ideas of how a single European gas end electricity market should function). After 40 years of Economic Union the liberalisation of the gas and electricity markets is as yet not fully realized.

As to the broad categories of the rules making up the body of E.U. energy legislation, an attempt of classification yields following results:

• quite a few measures are of a statistical informative nature: Member states are requested to inform the Commission of investment projects, prices, imports or experts, etc. These are the easiest rules and regulations to comply with.

• another series of measures is of a technical nature: maximum lead and sulphur contents of petrol, minimum stocks, substitute fuel components are examples. The compliance with this kind of rules has more to do with technical capabilities than with political will.

• another series of measures belongs to the field of policy making: examples are the decisions establishing community rules for State aid to the coal industry, the directives on the organisation of the internal gas and electricity markets, methods of which can clash with the political desirability of maintaining employment in the region involved; the rule that gas and/or electricity prices ought to reflect long-term marginal costs can clash with social policy considerations to provide low-income earners with cheap energy.

• a final group of measures concerns action-programs in which the E.U. plays a role of promoting and stimulating of investments and for which complementary financial resources are available (Thermie, Save, Altener).

Footnotes

[1] European Foundation for Cooperation in Energy Economics "E.U. Energy Policy 1958-2000", Brussels, January 2001 - for details see the end of this article.

[2] European Commission:"For a European Union Energy Policy" - European Commission Green Paper, January 1995

Specific E.U.-Energy Policy Measures

The following pages present a synopsis of the Acquis Communautaire classified by subject.

Volume I : General Energy Policy Aspects

1 Objectives Community Energy Policy (241/86/EC)
2 Information on Energy Supplies (1729/76/EC)
3 Research and development
  a Promotion on energy technology (Thermie) (2008 90/EEC)
  b Technological development program for non-nuclear energy (484/91/EC)
4 Award of Contracts
  a Information on contracts awarded for exploration and for extraction of oil, gas, coal and other solid fuels (327/93/EC)
  b Procurement procedures in the water, energy, transport and telecommunication sectors (531/90/EC, 13/92/EC and 38/93/EC)
  c Extension of procurement procedures to U.S.A. (324/93/EC)
  d Exclusion of U.K. from procurement procedures (425/93/EC)
  e Procedures for the award of public works contracts (27/93/EC)
5 International Cooperation
  a The Synergy programme (701/97/EC and 2598/97/EC)
  b Programme 1998-2002 for international cooperation (99/21/EC, 99/22/EC and 99/23/EC)
6 The Energy Charter and the Charter Protocol (181/98/EC,ECSC,Euratom)
  a Application of Energy Charter Treaty and Protocol by the European Community
  b Decisions with respect to the Energy Charter Treaty
  c Energy Charter Protocol on energy efficiency and environment

(continued on page 26)

European Energy Policy *(continued from page 25)*

Volume 2 : Oil, Gas and Electricity

I OIL

A *Foreign Trade*

1 Common rules for imports (1243/86/EEC, 518/94/EC and 3285/94/EC)

2 Common rules for exports (2603/69/EEC and 1934/82/EEC)

3 Registration of petroleum products imports (649/80/EEC and 713/80/EEC)

4 Notification of imports and exports crude oil and natural gas (545/96/EC and 546/96/EC)

5 Licensing of intra-Community trade in oil (374/97/EC)

6 Modernisation of Polish oil sector (367/98/EC)

B *Security of Supply*

1 Authorisation for prospection, exploration and production of hydro-carbons (22/94/EC)

2 Hydro-carbon exploration in Greenland (547/96/EEC)

3 Minimum stocks of crude oil and petroleum products (414/68/EEC, 416/68/EEC, 425/72/EEC and 93/98/EC

4 Difficulties in the supply of crude oil and petroleum products (238/73/EEC, 706/77/EEC and 639/79/EEC)

5 Restrictions in use of petroleum products in power stations

6 (405/75/EEC and 8/97/EC)

C *Investment Projects*

Notification of investment projects (1056/72/EEC, 1215/76/EEC, 3025/77/EEC and 736/96/EC)

D *Prices*

1 Information and consultation on the prices of crude oil and petroleum products (491/76/EEC, 190/77/EEC and 883/81/EEC)

2 Information and consultation on crude oil supply costs and consumer prices of petroleum products (280/99/EC)

E *Components in liquid fuel*

1 Use of substitute fuel components in petrol (536/85/EECand 441/87/EEC)

2 Lead content of petrol (210/85/EEC and 416/87/EEC)

3 Sulphur content of liquid fuels (12/93/EC and 32/93/EC)

II ELECTRICITY AND GAS

A *Transit*

1 Transit of Electricity (547/90/EEC and 167/92/EEC)

2 Transit of natural gas (296/91/EEC)

B *Internal Market*

1 Common rules for internal market in electricity (92/96/EC)

2 Common rules for internal market in natural gas 30/98/EC)

C *Prices*

Gas and electricity prices charged to industrial end users (377/90/EEC, 87/93/EEC and 653/90/EEC)

D *Trans-European Networks*

1 Community financial aid (2236/95/EC and 1655/99/EC)

2 Guidelines for trans-European energy networks (1254/96/EC and 1047/97/EC)

Volume 3 : Coal and Nuclear Energy

I COAL

1 Definition of "hard coal" and "brown coal"

2 Imports

Surveillance of imports of hard coal from third countries (707/77/ECSC and 161/85/ECSC)

3 State Aid

a Rules for State aid (3632/93/ECSC)

b United Kingdom (514/96/ECSC and 376/97/ECSC)

c Italy (515/96/ECSC)

d France (458/96/ECSC)

4 Investment

Information on investments (22-66/73/ECSC and 2237/73/ECSC)

5 Trade

a Prohibited commercial practices (30/53/ECSC, 1/54/ECSC, 19/63/ECSC, 1831/81/ECSC and 440/72/ECSC)

b Minimum stocks at thermal power stations (339/75/ECSC and 7/97/ECSC)

6 Prices

a Accounting documents (14/64/ECSC)

b Alignment of prices (443/72/ECSC)

c Protection against dumped or subsidized imports from third countries (2177/84/ECSC)

7 Technology

Clean and efficient use of solid fuels 1998-2002 (24/99/EC)

II NUCLEAR ENERGY

1 General Aspects

a Procedures Arbitration Committee (7/63/Euratom)

b Euratom classified information regulation (3/63/Euratom)

c Safeguard provisions (3227/76/Euratom, 2130/93 Euratom and 25/99/Euratom)

2 Supply

a Euratom Supply Agency (1/58/Euratom, 2130/93/Euratom and 25/99/Euratom)

b Transfer of small quantities (17/66/Euratom and 3137/74/Euratom)

3 Financing and Investment

a Euratom loans (270/77/Euratom, 271/77/Euratom and 212/92/Euratom)

b Investment projects regulation (4/58/Euratom, 1/58/Euratom and 2587/99/Euratom)

4 Protection Measures

a Advisory Committee on reprocessing irradiated nuclear fuels (237/80/Euratom)

b Shipments of radioactive (3/92/Euratom and 1493/93/Euratom)

c Safety standards against ionising radiation (836/80/Euratom, 467/84/Euratom, 466/84/Euratom, 641/90/Euratom, 29/96/Euratom and 43/97/Euratom)

5 International Cooperation

a Canada (217/78/Euratom)

b U.S.A. (50/74/Euratom, 254/74/Euratom and 314/76/Euratom) c Convention on nuclear safety (819/99/Euratom)

Volume 4 : Energy Savings and Renewables

I RATIONAL USE OF ENERGY

1 Energy efficiency

a Performance of heat generators and insulation (170/78/EEC and 885/82/EEC)

b Refrigerators and freezers (57/96/EEC)

c Hot-water boilers (42/92/EEC)

d Use of electricity (364/89/EEC, 565/91/EEC, 76/93/EEC and 737/96/EEC)

2 Labelling

a Labelling of household appliances (531/79/EEC and 75/92/EEC)

b Washer-driers (60/96/EEC)

c Washing machines (89/96/EEC)

d Dishwashers (17/97/EEC)

e Household lamps (11/98/EEC)

II RENEWABLES

1 Forestry and wood products (412/92/EEC and 413/92/EEC)

2 Altiner programme (500/93/EC and 352/98/EC)

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4th USAEE/IAEE/Allied Social Science Associations Meeting

Atlanta, GA - January 4 - 6, 2002

The IAEE annually puts together an academic session at the ASSA meetings in early January. This year's session will be structured by Carol Dahl of the Colorado School of Mines.

The theme for the session will be "*Current Issues in Energy Economics and Modeling.*"

If you are interested in presenting please send an abstract of 200-400 words to Carol Dahl at (cadahl@mines.edu) by May 25, 2001. Preliminary decisions on papers presented and discussants will be made by July 1. The program including abstracts will be posted at iaee@iaee.org by September 1, 2001. Please send abstracts in electronic format that is easily converted into program information. (e.g. word, wp, text).

For complete ASSA meeting highlights and pre-registration information please visit:
http://www.vanderbilt.edu/AEA/index.htm

Assistant Book Review Editor Appointed

Carol Dahl of the Colorado School on Mines has been appointed Assistant Book Review Editor of *The Energy Journal,* assisting Book Review Editor, Dick Gordon.

Campbell Watkins, Joint Editor, The Energy Journal.

Conference Proceedings on CD Rom
23rd International Conference
Sydney, Australia, 7-10 June, 2000

The Proceedings of the 23rd International Conference of the IAEE are available from IAEE Headquarters on CD Rom. Entitled *Energy Markets & the New Millennium: Economics, Environment, Security of Supply*, the price is $95.00 for members and $115.00 for non members (includes postage). Payment must be made in U.S. dollars with checks drawn on U.S. banks. Complete the form below and mail together with your check to:Order Department, IAEE, 28790 Chagrin Blvd., Suite 350 Cleveland, OH 44122, USA.

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The 3[rd] Workshop of the CZAEE

At the end of last year, century and millennium (as you wish) the 3[rd] workshop of CZAEE took place in Prague at the seat of Prazska teplarenska a.s. (Prague Heating Company Plc.). Problems addressed at this meeting were those that are now driving the discussion within the Czech electricity industry including the main regulatory bodies (the Ministry of Finance, the Ministry of Industry and Trade and Regulatory Office for Energy Sector) – i.e., providing the short-term operation and control (also called system services or ancillary services – all those terms are used in this article interchangeably). Representatives of IPPs, heating plants, heating suppliers and independent experts attended the workshop and contributed substantially to its quality.

Opening Word

At the beginning of the workshop the vice president of CZAEE, Ivan Benes, summarized some activities of the CZAEE during the year 2000 and described the situation on the Czech electricity market in general.

There are some problems that determine the atmosphere within the industry and incentives of the most important players at the marketplace. First, there is a governmental decision to privatize athe remaining state shares within the electricity and gas industry using the method "the winner takes it all".

Second, despite this decision, the government still plays a schizophrenic role within the industry – it is the main referee and regulator (no matter that different bodies carry different names and responsibilities). It is still one of the most important shareholders in the most important network companies (CEZ a.s., etc.). And moreover it is still the creator of all rules that directs who, when, where, how and for what price can take a part at the market place.

Third, the most important companies within the industry that are, as stated above, owned by the state itself captured the regulator.

Fourth, the existing IPPs are besieged as a result of the regulation by asymmetric prices, market substitutes, state owned companies, potential competitors and the government itself.

Fifth, this situation decreases not only the market value and the position of the IPPs but the market value and the position of the CEZ a.s. as well. But the real loser in this game is the Czech consumer and taxpayer.

The contemporary situation within the industry demands a strong, enlighted and independent regulator that can substantially contribute to the needed reform of the industry. In the end we do not need any regulator since the market itself can generate suitable incentives for all players. Unfortunately this is not the case in the Czech electricity industry and it is expected that their European and world competitors will capture all Czech firms since their position has been significantly worsened by the regulatory framework during the last ten years. Moreover this development continues.

Main Lecture

The main theme of the workshop was the speech of the research fellow and project manager Miroslav Zajicek ftom CityPlan Ltd. who focused on the problem of providing the short-term operation and control (system services or ancillary services) and the proposed solution.

At the beginning he briefly characterized the co-movements of electricity consumption and GDP in 1990s. In the first half of this period the elasticity of electricity consumption to the GDP was lower than one (approximately 0,5) – i.e., GDP fell more than the electricity consumption. On the other hand, during the following five-year period the situation changed – elasticity increased to higher values (approx. 0,6). In other words, electricity consumption variation showed more GDP-like movements. The results of this development were the following: wrong predictions of future electricity consumption (resulting from wrong forecasts of GDP and wrong assumptions on elasticity) and excessive investment in power generation (this excess of investment was the result not only of wrong predictions of future electricity consumption but of the rate-of-return regulation as well). Moreover those investments petrified the existing structure of power generation that is definitely not optimal. This increase of installed power generation capacity is pretty obvious when one look at the graphs showing installed power capacity and consumption of electricity. Even during the recent decline of electricity consumption installed power capacity grew continuously.

To be able to understand the connection between recent development within Czech regulation (the pricing of the short-term operation and control) and the state of installed power capacity we have to turn our attention to some international experience in electricity markets. There are some common features that can be summarized in the following way: implementation of third party access, complete liberalization of power generation and electricity trade, continuation of price regulation for transmission and distribution networks and different solutions for the regulatory market and the short-term operation and control.

In addition to this mainstream approach in electricity market deregulation (or one can call it more appropriately the "re-regulation") there are huge changes on the micro level. Under the previous system the most important part of costs in the electricity industry was electricity generation – about 70 %. Transmission, distribution and ancillary services required just 30 %. In the opened marketplace this ratio changed considerably – in fact it is the same, but turned upside down. Electricity generation amounts to just 30 % and transmission, distribution and ancillary services amounts to 70 %. How is this development possible?

Economic theory concludes that this development is the necessary result of the way the contemporary "re-regulation" was implemented. Those companies whose parts are still under the regulation (i.e., transmission, distribution and system operation) have a strong incentive to transfer costs from deregulated parts of the industry (power generation) into the regulated ones in order to undercut their bidding prices on those deregulated parts to get a competitive advantage and cover costs from revenues gathered out of regulated services. Those regulated parts are the "trash cans" where some incumbent companies are trying to put their stranded investments to cover their stranded costs. This is the main force that drives the costs evolution. And the same principle is behind the development in the Czech Republic.

There are no discussions whether to open the market with power generation or not – it will be opened. Even though there is considerable delay in this field (moreover, contradicting the EU directive) one can be an optimist. As a good example one can look at the Netherlands or Austria where the government shortened the transition period (i.e., hastened the market opening) from 2007 to 2004, respectively from 2004 to 2003. In addition to this fact, transmission cannot be a suitable "trash can" for covering stranded costs since the only supplier into the transmission network is CEZ a.s. (Except for Vresova power station that is connected into the transmission network as well, other IPPs are connected into the distribution network only.) By increasing transmission fees the CEZ a.s. would increase the price of its own electricity and would worsen its market position.

What is much more suitable for this purpose (i.e., to cover stranded costs) within the Czech regulatory framework are the fees for the short-term operation and control – the ancillary services and the regulatory market. Everybody would agree that short-term operation and control is a necessity. But what the really interesting questions are "what is technically necessary, who should provide the short-term operation and control, for what price and how this price should be charged".

There are some proposed solutions of this problem especially those of EGU (research institute and consulting company based in Brno), MI&T (Ministry of Industry and Trade), CEPS (Czech Electricity Grid Plc) and CEZ (our incumbent monopolist). Those solutions have been heavily based on the contemporary structure of Czech electricity network, on the coverage of stranded costs and on including even those reserve generators, which offer their capacity over one hour. Using those presumptions we would get an incredible amount of money required to cover the provision of the short-term operation and control – approx. 8,3 billions of CZK. (Approx. 220 mil. USD, 4,13 USD/MWh.)

On the other hand, the solution proposed by CityPlan Ltd. has been based on totally different assumptions: the short-term operation and control (system services) includes just non-tradable part of system coordination – up to one trading hour, the task of regulator is not to assure the financing of any investment ever made, the main criterion are reproduction long term marginal costs. Following those assumptions one would get a sum needed to assure the provision of the short-term operation and control that is substantially lower than the one proposed above – approx. 2 billions of CZK. (Approx. 51 mil. USD, 0,9 USD/MWh.)

Moreover, the provision of short-term operation and control is monopolized in hands of CEPS by the law (the Energy Act) and the main provider of those system (ancillary) services is CEZ. In the opinion of CityPlan, the state as the owner of CEZ is trying to use the short-term operation and control as a "trash can" for its stranded costs and by using this "captured" market to strengthen its financial position it is trying to acquire a bigger share on the power market that is about to be opened at least partially next year.

Possible solution of this phenomenon, not just specific for the Czech market from the general point of view, is to open even the rest of the electricity market for competition. The ancillary services should include just non-tradable part of the service (up to one trading hour); additional provision of the regulatory power and short-term control should be solved on the base of the regulatory market (i.e., a Nordpool-like solution where even costumers could express their willingness to pay for the regulatory power). The government should hasten the opening of the market and let the market participants create the pool. Any bans on international trade should be abandoned as well as all restrictions on the building of any new electricity networks. Those liberalization steps should be accompanied with the end of price regulation on transmission and distribution. As a result of this deregulation there is no need for any regulator since there are no tasks left for him.

After this main lecture given by Mr. Zajicek a very inspiring discussion took place. All attendants expressed in general a broad consensus on issues presented by Mr. Benes and Mr. Zajicek.

Let's hope such interesting events will continue in the following year.

Miroslav Zajicek

Electricity Reliability *(continued from page 15)*

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Oil and Energy Trends, Vol. 25 (2000). Price: $1,454.00. Contact: Wendy Fox, Blackwell Publishers, 108 Cowley Road, Oxford OX4 1JF, United Kingdom. Phone: 44-0-1865-791100. Fax: 44-0-1865-791347.

The New Oil & Gas Exchanges, Gwen Farnsworth and RPI. Price: L295.00. Contact: Financial Times Energy Direct Response Team, Maple House, 149 Tottenham Court Road, London W1P 9LL, United Kingdom. Phone: 44-0-20-7896-2241. Fax: 44-0-20-7896-2121.

Oil, Natural Gas and Petrochemicals in The Middle East, North Africa and Central Asia, 1500+ pages. Price: $840.00. Contact: Reference Corporation, PO Box 45610, Seattle, WA 98145. Fax: 206-985-1945.

Fisher-Tropsch Gas-to-Liquids (September 2000), Fred Thackeray. Price: L595. Contact: Customer Services, Smi Publishing Ltd, No 1 New Concordia Wharf, Mill Street, London SE1 2BB. Phone: 44-0-20-7252-2222. Fax: 44-0-7252-2272.

The Middle East & North Africa: Outlook for Oil & Gas in an Era of Deregulation (October 2000), 100 pages. Price: $530.00. Contact: Petroleum Economist Ltd, 15-17 St. Cross Street, London EC1N 8UW, UK. Phone: 44-0-20-7831-5588. Fax: 44-0-20-7831-4567-7831-53133.

World Energy Almanac, 2000 Edition (August 2000), 70 pages plus CD-ROM. Price: $155.00. Contact: The Petroleum Economist, PO Box 105, Baird House, 15/17 St Cross Street, London EC1N 8UW, UK. Phone: 44-0-20-7831-5588. Fax: 44-0-20-7831-4567-7831-53133.

Fundamentals of the Global Power Industry, 2000 Edition (August 2000), 100 pages. Price: $225.00. Contact: The Petroleum Economist, PO Box 105, Baird House, 15/17 St Cross Street, London EC1N 8UW, UK. Phone: 44-0-20-7831-5588. Fax: 44-0-20-7831-4567-7831-53133.

Energy in the CIS and Eastern Europe Yearbook (April 2000), 100+ pages. Price: $155.00. Contact: The Petroleum Economist, PO Box 105, Baird House, 15/17 St Cross Street, London EC1N 8UW, UK. Phone: 44-0-20-7831-5588. Fax: 44-0-20-7831-4567-7831-53133.

World Energy Yearbook, 2000 Edition (April 2000), 128 pages. Price: $155.00. Contact: The Petroleum Economist, PO Box 105, Baird House, 15/17 St Cross Street, London EC1N 8UW, UK. Phone: 44-0-20-7831-5588. Fax: 44-0-20-7831-4567-7831-53133.

Energy Derivatives: Trading Emerging Markets, Peter Fusaro & Jeremy Wilcox. Price: $85.00. Contact: Whitehurst & Clark Book Fulfillment Inc., Raritan Industrial Park, 100 Newfield Avenue, Edison, NJ 08837 USA. Phone: 732-225-2727. Fax: 732-225-1562.

Liberalising Gas Markets in Europe: The Implementation and Implications of the EU Gas Derective (August 2000). 120 pages. Price: $530.00. Contact: The Petroleum Economist, PO Box 105, Baird House, 15/17 St Cross Street, London EC1N 8UW, UK. Phone: 44-0-20-7831-5588. Fax: 44-0-20-7831-4567-7831-53133.

Adapting to a Liberalising European Power Market (August 2000), 120 pages. Price: $530.00. Contact: The Petroleum Economist, PO Box 105, Baird House, 15/17 St Cross Street, London EC1N 8UW, UK. Phone: 44-0-20-7831-5588. Fax: 44-0-20-7831-4567-7831-53133.

UK Oil Company Profits and Benchmarks 2001. Gilbert Jenkins. Price £48. Contact: Sunningdale Publications, 1 Hamilton Drive, Sunningdale, Berkshire SL5 9PP United Kingdom. Phone: 44-1-344-623955

Aviation Fuels Business Worldwide 2001, Gilbert Jenkins, Editor. £95. Contact: Sunningdale Publications, 1 Hamilton Drive, Sunningdale, Berkshire SL5 9PP United Kingdom. Phone: 44-1-344-623955

Project Finance Yearbook 2000/2001, 10th Edition. Price: $205.00. Contact: Stephanie Chauvin, Euromoney Yearbooks, Nestor House, Playhouse Yard, London EC4V 5EX, UK. Phone: 44-0-20-7779-8999. Email: Yearbooks@euromoneyplc.com

International Oil & Gas Review 2001, 5th Edition. Price: $170.00. Contact: Stephanie Chauvin, Euromoney Yearbooks, Nestor House, Playhouse Yard, London EC4V 5EX, UK. Phone: 44-0-20-7779-8999. Email: Yearbooks@euromoneyplc.com

Global Utilities Finance Report 2001, 4th Edition. Price: $170.00. Contact: Stephanie Chauvin, Euromoney Yearbooks, Nestor House, Playhouse Yard, London EC4V 5EX, UK. Phone: 44-0-20-7779-8999. Email: Yearbooks@euromoneyplc.com

International Power Finance Review 2000/2001, 5th Edition. Price: $170.00. Contact: Stephanie Chauvin, Euromoney Yearbooks, Nestor House, Playhouse Yard, London EC4V 5EX, UK. Phone: 44-0-20-7779-8999. Email: Yearbooks@euromoneyplc.com

Calendar

14-15 March 2001, Keeping the Lights On: Electric Tradition or Innovation? Chatham House, London. Contact: Catherine O'Keeffe, Acting Head, Conference Unit, The Royal Institute of International Affairs, 10 St James's Square, London, SW1Y 4LE, United Kingdom. Phone: 44-20-7957-5700. Fax: 44-20-7321-2045 URL: www.riia.org

20-22 March 2001, Electric Power 2001, Baltimore, MD, USA. Contact: Heather Haygood, Electric Power Conference & Exhibition, 1220 Blalock Road, Suite 310, Houston, TX, 77055, USA. Phone: 713-463-9595. Fax: 713-463-9997 Email: event@electricpower.com URL: www.electricpowerexpo.com

20-22 March 2001, 2001 e-ProCom for: Utility & Energy e-Business, Baltimore, MD, USA. Contact: The TradeFair Group Inc., 1220 Blalock Road, Suite 310, Houston, TX, 77055, USA. Fax: 713-463-6427 URL: www.e-procomseries.com/energyseries.html

24-29 March 2001, Middle East Petroleum & Gas Conference. Dubai, UAE. Contact: Conference Connection Inc., PO Box 1736, Raffles City, Singapore, 911758, Singapore. Phone: 65-226-5280. Fax: 65-226-4117 Email: info@cconnection.org URL: www.cconnection.org

26-27 March 2001, The Regulation of Natural Gas, Sarnico, Italy. Contact: Jacquie Hay, Marketing Assistant, CEPMLP, University of Dundee, DD1 4HN, Scotland, UK. Phone: 44-1382-344300. Fax: 44-1382-322578 Email: cepmlp@dundee.ac.uk URL: www.cepmlp.org

28-29 March 2001, Financing Natural Gas Projects, Sarnico, Italy. Contact: Mrs Moira McKinlay, Seminar Co-ordinator, CEPMLP, University of Dundee, Dundee, DD1 4HN, Scotland, UK. Phone: +44 (0) 1382 344303. Fax: +44 (0) 1382 345854 Email: m.r.mckinlay:dundee.ac.uk URL: www.cepmlp.org

2-3 April 2001, Winter's Aftermath: A New Era for Northern & Frontier Gas, Houston, Texas. Contact: Ziff Energy Group. Phone: 403-234-6555. Fax: 403-627-9034 Email: gasconference@ziffenergy.com URL: www.ziffenergyconferences.com

25-27 April 2001, 24th IAEE International Conference, "2001: An Energy Odyssey?", Houston, Texas - USA. Contact: David Williams, Executive Director, IAEE, 28790 Chagrin Blvd., Suite 350, Cleveland, Ohio, 44122, USA. Phone: 216-464-5365. Fax: 216-464-2737 Email: iaee@iaee.org URL: www.iaee.org/conferences/conferences.asp

April 30, 2001 - May 4, 2001, Understanding the Fundamental Elements of International Oil and Gas Investment:

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The Policy, Regulatory and Tax Framework. Contact: Mrs. Moira McKinlay, Seminar Co-ordinator, CEPMLP, University of Dundee, Dundee DD1 4HN, Scotland, UK. Phone: +44 (0) 1382 344303. Fax: +44 (0) 1382 345854 Email: m.r.mckinlay@dundee.ac.uk URL: www.cepmlp.org

7-11 May 2001, Contracts used in International Petroleum Development. Contact: Mrs Moira McKinlay, Seminar Co-ordinator, CEPMLP, Centre for Energy, Petroleum and Mineral Law & Policy, University of Dundee, Dundee DD1 4HN, Scotland, UK. Phone: +44 (0) 1382 344303. Fax: +44 (0) 1382 345854 Email: m.r.mckinlay@dundee.ac.uk URL: www.cepmlp.org

14-18 May 2001, International Petroleum Fiscal Systems and Design. Contact: Mrs Moira McKinlay, CEPMLP, Centre for Energy, Petroleum and Mineral Law and Policy, University of Dundee, Dundee DD1 4HN, Scotland, UK. Phone: +44 (0) 1382 344303. Fax: +44 (0) 1382 345854 Email: m.r.mckinlay@dundee.ac.uk URL: www.cepmlp.org

21-25 May 2001, Risk Analysis and Decision Making in Petroleum Exploration. Contact: Mrs Moira McKinlay, CEPMLP, Centre for Energy, Petroleum and Mineral Law and Policy, University of Dundee, Dundee. DD1 4HN, Scotland, UK. Phone: +44 (0) 1382 344303. Fax: +44 (0) 1382 345854 Email: m.r.mckinlay@dundee.ac.uk URL: www.cepmlp.org

4-8 June 2001, Global Issues in Corporate Mining Strategy and Government Policy. Contact: Mrs Moira McKinlay, Seminar Co-ordinator, CEPMLP, Centre for Energy, Petroleum and Mineral Law and Policy, University of Dundee, Dundee DD1 4HN, Scotland, UK. Phone: +44 (0) 1382 344303. Fax: +44 (0) 1382 345854 Email: m.r.mckinlay@dundee.ac.uk URL: www.cepmlp.org

24-27 July 2001, Increasing Productivity Through Energy Efficiency, Tarrytown, NY. Contact: American Council for an Energy Efficient Economy, 1001 Connecticut Avenue NW, Suite 801, Washington, DC, 20036, USA. Phone: 302-292-3966 URL: www.aceee.org

27-31 August 2001, Corporations, Communities, Human Rights and Development. Contact: Mrs Moira McKinlay, Seminar Co-ordinator, CEPMLP, Centre for Energy, Petroleum and Mineral Law and Policy, University of Dundee, Dundee DD1 4HN, Scotland, UK. Phone: +44 (0) 1382 344303. Fax: +44 (0) 1382 345854 Email: m.r.mckinlay@dundee.ac.uk URL: www.cepmlp.org

3-7 September 2001, Negotiation and Documenting Petroleum Industry Transactions. Contact: Mrs Moira McKinlay, Seminar Co-ordinator, CEPMLP, Centre for Energy, Petroleum and Mineral Law and Policy, University of Dundee, Dundee DD1 4HN, Scotland, UK. Phone: +44 (0) 1382 344303. Fax: +44 (0) 1382 345854 Email: m.r.mckinlay@dundee.ac.uk URL: www.cepmlp.org

10-14 September 2001, Natural Gas Negotiations and Contracts. Contact: Mrs Moira McKinlay, Seminar Co-ordinator, CEPMLP, Centre for Energy, Petroleum and Mineral Law and Policy, University of Dundee, Dundee, Scotland, UK. Phone: +44(0)1382 344303. Fax: +44(0)1382 345854 Email: m.r.mckinlay@dundee.ac.uk URL: www.cepmlp.org

10-12 September 2001, Energy Economy 2000, Houston, Texas - USA. Contact: Nancy Aloway, Event Director, PennWell, 1421 South Sheridan Road, Tulsa, OK, 74112-6600, USA. Phone: 918-831-9438. Fax: 918-832-9201 Email: nancya@pennwell.com URL: www.pennwell.com

27-29 September 2001, Hydro 2001 Conference & Exhibition, Riva del Garda, Italy. Contact: Hydro 2001, Aqua-Media International, 123 Westmead Road, Sutton, Sutton, Surrey SM1 4JH, United Kingdom. Phone: 44-20-8643-4727. Fax: 44-20-8643-8200 Email: conf@hydropower-dams.com URL: www.hydropower-dams.com

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