IAEE INTERNATIONAL ASSOCIATION FOR ENERGY ECONOMICS

IAEE Newsletter

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Editor: *David L. Williams* **Contributing Editors**: *Paul McArdle, Tony Scanlan and Marshall Thomas*

Second Quarter 2000

President's Message

Welcome to the second edition of the *IAEE Newsletter* for 2000. The first quarter of this year has been a volatile period in energy markets and it has even now begun to be claimed that oil, in particular, has become repoliticised again for the first time in almost a decade. Oil market volatility has been at the forefront with crude prices peaking at over $30 in early March. OPEC's Vienna meeting agreed to increase production and this led to prices easing by over $5 per barrel. Gasoline prices have also risen and the issue of the level of both gasoline prices and gasoline taxation has hit the headlines in many oil consuming countries. Natural gas has not escaped the volatility despite yet another warm winter in both North America and Europe. U.S. natural gas prices are now exceeding $3 per mmbtu at Henry Hub as fundamentals tightened and storage levels drop.

In face of this market volatility and uncertainty and the continued structural changes in energy industries, the environment is rich in controversy as we move towards the IAEE conference season. Preparations are now well advanced for the 23rd IAEE Annual International Conference which will be held in Sydney Australia, 7-10 June under the enthusiastic Chairmanship of Tony Owen of the University of New South Wales. These will be followed after the summer by two regional conferences. The 2000 European Conference *Towards an Integrated European Energy Market* will be held in Bergen, Norway, August 31-September 1 and the 21st Annual North American conference of the USAEE/IAEE *Transforming Energy* will be held in Philadelphia, PA, September 24-27. Details of this and other IAEE conferences can be found on the IAEE web pages at www.IAEE.org and elsewhere in this *Newsletter*.

The Council of the IAEE will be meeting before the Sydney conference and will be taking the opportunity to review the Association's longer term strategy. Our prime aim is to provide better services for our membership. As part of this we will be considering, in particular, how we can enhance the web services that we offer. We are aware that we have an unrivalled international network and access to large amounts of high quality energy economics content. Our aim will be to create new structures to raise the accessibility of both. Comments and suggestions on both this and other issues will be welcomed from all the membership.

Finally I would like to announce that Frits van Oostvoorn of the Energy Research Foundation in the Netherlands has succeeded Hans Larsen of the Risø National Laboratory in Denmark as the European Regional Representative on Council. We welcome Frits and would like to thank Hans for his contribution to the Council over the last several years.

Peter Davies

Editor's Note

We cover a wide variety of topics in this issue. We open with a report from a group from the Netherlands Energy Research Foundation, SRC International, Prague, and the Foundation for Economic Research SEO, University of Amsterdam, on the development of three long-term energy scenarios for the Czech Republic. Covering the period 1995 to 2030, the study reports, among other things, that total primary energy requirements will rise about 14% if all cost-effective energy measures are implemented; much more if such measures are not implemented. Further, the Kyoto target for the Czech Republic should be met without difficulty.

Laney Littlejohn asks the question, "Will there always be too many refineries?" He then proceeds to answer it, noting the problems with existing capacity data, and the difficulties with the justification of refinery construction based on "strategic" and "vertical integration" needs. He concludes that spontaneous optimism or "animal spirits" play a very important role in refinery investment decisions and that as a

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23rd ANNUAL IAEE INTERNATIONAL CONFERENCE

Hilton Sydney Hotel, Sydney, Australia, 7-10 June 2000

Theme

Energy Markets and the New Millennium:
Economics, Environment, Security of Supply

The year 2000 is an ideal time to reflect on the dominant role of fossil fuels over the past century and assess how this pattern of reliance will change in the context of the liberalisation of energy markets and environmental pressures and concerns. This conference will consider: electricity market liberalisation: international experiences and expectations; the economics of renewable energy technologies; Asian energy markets and macro-financial management; liberalisation of international trade in energy resources; the geopolitics of energy supply: social, cultural, political and philosophical dimensions of energy sector restructuring; transport policy in the new millennium; and carbon sequestration and recycling.

Sydney (the Olympic City in the year 2000) has many attractions for both participants and accompanying persons, in addition to the world famous Harbour Bridge and Opera House. City and harbour tours are readily available, while longer trips into the Australian "bush" can be made with a hire car. World class vineyards are just two hours drive to the north of Sydney, sharing the area with some of Australia's largest open cast coal mines. The nation's capital, Canberra, is a 40-minute flight to the south of Sydney.

CONFERENCE AND HOTEL REGISTRATION

Please consult the AAEE web site (www.aaee.unsw.edu.au) for conference information and conference and hotel registration forms that can be down loaded and returned to the Secretariat by mail or fax.

POST-CONFERENCE BARRIER REEF TOUR

Billed as "The Ultimate Cruise", the highlight of the conference recreational programme is the opportunity to undertake a four-night post-conference cruise on the Great Barrier Reef, ex-Cairns in North Queensland. This is an opportunity to see one of the wonders of the world at a very reasonable price. The cruise sails from Cairns at 2 p.m. on Monday 12 June and you will spend four nights at sea in a comfortable twin-share Stateroom. Full details of the tour itinerary, the tour vessel and advice on minimising air fares to Cairns are available on request from the Secretariat.

The cost of the four-night cruise is A$1660 per person twin share (A$2490 for single occupancy). This cost includes all accommodation, all meals, snorkelling, glass bottom boat tours, guided walks, and use of all on-board facilities. A marine naturalist accompanies all cruises. The cost does not include optional tours, beverages, gift shop purchases, scuba diving (there is a nominal fee per dive), or the Environmental Management Charge (currently A$12).

Note: Current exchange rate is approximately US$1.00 = A$1.50.

SECRETARIAT
Cynthia Grant, NewSouth Global Ltd.
The University of New South Wales
Sydney, NSW 2052, AUSTRALIA

Tel: (+612) 9385 3184 Fax: (+612) 9662 6566 Email: cynthia.grant@unsw.edu.au

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

Transforming Energy

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

We are pleased to announce the 21st Annual North American Conference of the USAEE/IAEE, ***Transforming Energy***, scheduled for September 24-27, 2000, in Philadelphia, Pennsylvania at the Wyndham Hotel.

Please mark your calendar for this exciting meeting. This year the conference has been organized to focus on selected themes. Leaders from industry and academia have been invited to share their views and concerns for the transformation in energy markets expected for the next decade. The five plenary sessions will be followed by concurrent sessions designed to focus attention on major sub-themes. Industry participants, bringing sharp focus to the emerging analytical challenges the industry faces, will lead these sessions. Ample time has been reserved for more in-depth discussion of the papers and their implications. Key sessions and themes of the conference are as follows:

Transportation: Implications of the Technological Sea Change
Session Chair: Jim Sweeney, Stanford University
- Vehicles: Challenging the Internal Combustion Engine
- Transportation Fuels: Challenging Petroleum's Dominance
- Enticing Consumers: The Ultimate Challenge

Evolving Electricity Markets: From Ratebase to Revenue – The Roles of Technology Investment
Session Chair: Steve Connors, MIT
- Grid Operation and Expansion: Success and Failures
- Bulk Power – Investment, Economic and Environmental Performance
- Retail Competition – Delivering Value to Consumers

Power, Gas & Coal: Maximizing Opportunity as Commodity Markets Merge
Session Chair: Steve Warwick, Koch Industries
- Commodity Convergence
- Risk Management
- Policies and Regulations

Paper Markets: Expanding their Scope and Impact on Energy Markets
Session Chair: Louise M. Burke, New York Mercantile Exchange
- The Role of Paper Markets in Price Formation
- Special NYMEX Trading Session

Charting the Path: Forces and Forecasts
Session Chair: Peter Davies, BP Amoco Plc.
- Global Economic Outlook
- Identifying Key Forces in Oil and Gas Markets
  - Global Oil Outlook
  - Global Gas Markets
  - North American Gas Markets
- Identifying Key Forces in Coal and Power Markets
  - Global Power Markets
  - North American Power Markets
  - Coal Markets: Prospects for North American and Global Markets

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

There are 20 planned concurrent sessions (note the enclosed information on Call for Papers for this meeting); please submit papers that address the transformation in energy markets and the themes listed above. Given the location of the meeting in Philadelphia this year, we anticipate an even larger draw to our concurrent sessions. The conference organizers STRONGLY SUGGEST that you get your abstract in extra early so that prompt follow-up can be given.

Your registration fee includes two lunches, a dinner, two receptions and numerous coffee breaks, all designed to increase your opportunity for networking. Special this year will be an evening at the famous Franklin Institute Science Museum.

Philadelphia, Pennsylvania is a wonderful and scenic/tourist place to meet. Single nights at the Wyndham Hotel are $150.00 (contact the Wyndham Hotel at 215-448-2000, to make your reservations). Conference registration fees are $500.00 for USAEE/IAEE members and $600.00 for non-members. Special airfares have been arranged through Conventions in America. Please contact Conventions in America by calling 619-232-4298 and reference our group code #606. These prices make it affordable for you to attend a conference that will keep you abreast of the issues that are now being addressed on the energy frontier.

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

Transforming Energy

21st Annual North American Conference of the USAEE/IAEE

Please send me further information on the subject checked below regarding the September 24-27, 2000 USAEE/IAEE Conference.

____ Submission of Abstracts to Present a Paper(s) _____ Registration Information _____ Sponsorship Information _____ Exhibit Information

NAME: _____
TITLE: _____
COMPANY: _____
ADDRESS: _____
CITY,STATE,ZIP: _____
COUNTRY: _____ PHONE/FAX: _____

USAEE/IAEE Conference Headquarters
28790 Chagrin Blvd., Suite 350, Cleveland, OH 44122 USA
Phone: 216-464-2785•Fax: 216-464-2768 Email: usaee@usaee.org

Development of Long-Term Energy Scenarios for the Czech Republic

*By M. Voogt, M. van Wees, A. de Raad, M. Malý, V. Splítek, J. Spitz, A. de Groot, and M. van Leeuwen**

Introduction

The Czech Government faces important decisions that will have a large impact on future energy supply and demand. These decisions need to be taken in the preparation of the Energy Policy Document of the Czech Republic, which has been carried out in the year 1999. This paper contains an executive summary of the results of the study "Development of integrated energy-environment scenarios for the Czech Republic", which was carried out in the scope of the EU Synergy Programme. The study aimed at providing policy makers insight in the impacts of key policy decisions in Czech energy policy in the next 35 years. The results were used for the preparation of the new Energy Policy.[1]

Methodology

To deal with the many uncertainties within a transition economy, a scenario approach was chosen as the basis of the analysis. The time horizon of these scenarios is the year 2030. Because the integration into the EU is a key political objective in the Czech Republic, three EU scenarios were used as the starting point to develop scenarios for the Czech Republic. These EU scenarios, which were developed by the European Commission, are called Battlefield (BF), Forum (FO) and Hypermarket (HM)[2]. The BF scenario assumes protectionism, fragmentation and low economic growth, combined with strong government intervention and an active social policy. In the FO scenario, global political consensus will pull economic growth. The European integration will stimulate technological innovation and harmonisation of taxes. The prospering economy and high environmental awareness result in a largely ecologically influenced energy policy. Finally, the HM scenario describes a well-developed market economy driven world, with little market imperfections such as trade barriers and ineffective government interventions. Short-term economic growth will be very high, but market tensions will slow down this growth in the longer run.

The EU scenarios provide quantitative time-series on a wide range of macro-economic indicators for the EU as a whole, like the price of oil and gas on the world market, the economic growth within Europe, general technological innovation, and labour and capital productivity. On the basis of the EU-scenarios, a further translation of quantitative and qualitative macro-economic scenario indicators to the Czech Republic was made. Assumptions were made on national economic growth, the integration of the Czech Republic into the EU, environmental restrictions and the development of VAT and excise taxes.

The modelling system that was used for the analysis has two components. The macro-economic analysis and the calculation of future energy demand were carried out with a Computable General Equilibrium (CGE) model of the Czech Republic. The CGE model takes account of all the interactions between markets, as well as the functioning of individual markets. In other words, all transactions within the economy are covered. The Energy Flow Optimisation Model (EFOM-ENV) was used to analyse the optimal energy supply and demand system. The EFOM-ENV model is a linear programming energy model, which describes the energy system by specifying energy conversion, transport, distribution technologies and energy saving options. The calculations are based on minimisation of the total discounted costs of the energy system.

Economic Growth and Energy Demand

Average economic growth in the Czech Republic is expected to range between 1.9 and 3.3% annually. Somewhat higher economic growth can either be achieved on the basis of European political consensus (Forum), or within the market-driven economic world as is assumed in the Hypermarket scenario. The realisation of an average macro-economic growth of 3% over a period of 35 years would bring the Czech Republic to an economically stable situation that significantly decreases the gap with EU economies.

Final energy demand (FED) is expected to increase over the time period considered, mainly as a result of economic growth. The yearly increase in total FED ranges between 0.4% (BF) and 0.8% (FO). FED growth rates are lower than economic growth rates since high increases in energy efficiency are assumed. Higher GDP growth rates in FO and HM induce relatively higher growth in FED than in BF. The relative share of industry will decrease, especially of energy-intensive industries in the FO and HM scenarios. The share of commercial services in the tertiary sector, and transport will increase.

In all scenarios the share of electricity increases: from 14% in 1995 to 18% in 2030. This matches the increasing electrification that has taken place in other European countries in the past years. Demand for heat also increases. The share of heat in FED goes from 17% in 1995 to 23-24% in 2030. This results in a growth of the district-heating sector.

The growth in the demand of energy services is partly compensated by the implementation of cost-effective energy efficiency improvement in supply and demand. Therewith, the average yearly increase in total primary energy requirement (TPER) is moderate in both the FO and HM scenario (about 0.5%/year) and small in the BF scenario (+0.1%/year).

Energy Efficiency and Energy Mix

Five factors influence the energy efficiency of the Czech economy: changes in economic structure, energy efficiency in end-use (energy conservation), technological innovation in energy supply and appliances, energy pricing and fuel switching.

The relative low increases in final and primary energy demand result from the modelling assumption of maximal increase in energy efficiency in energy supply and demand, i.e., all cost-effective measures are implemented. In reality, there are different kinds of market barriers that hamper the increase in energy efficiency, resulting in higher growth rates for energy demand. Therefore, strong and effective policy measures are required to reach the relatively low growth rates mentioned. Large efficiency increases can especially be

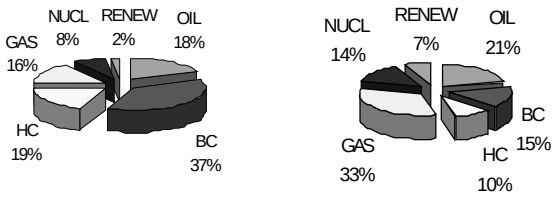
* M. Voogt, M. van Wees, and A. de Raad, are with the Netherlands Energy Research Foundation ECN; M. Malý, V. Splítek, J. Spitz, are with SRC International CS s.r.o. Prague; and A. de Groot, and M. van Leeuwen are with the Foundation for Economic Research SEO, University of Amsterdam.

obtained in heat supply.

The technical energy saving potential till the year 2010 is estimated at 48%. The economic potential (potential which is repaid during the lifetime of measures) is about 20%. For further details on the potentials of end use energy efficiency, barriers and energy efficiency policy, see [3].

Figure 1 shows the fuel mix of TPER in the base year 1995 and in the year 2030. Clearly the large share of brown coal significantly reduces. As a result of the commissioning of the Temelin NPP, the share of nuclear significantly increases. When appropriate policy measures are taken, the share of renewables could be increased to around 7% of TPER, but a strong promotion policy is required for this. The share of coal in the Czech Republic remains relatively high compared to the EU. Whereas the EU highly depends on imported oil products, the share of oil in the Czech Republic could remain almost stable, if sufficient measures are taken.

Figure 1
Structure of TPER, 1995 and 2030 (FO). BC: brown coal; HC: hard coal



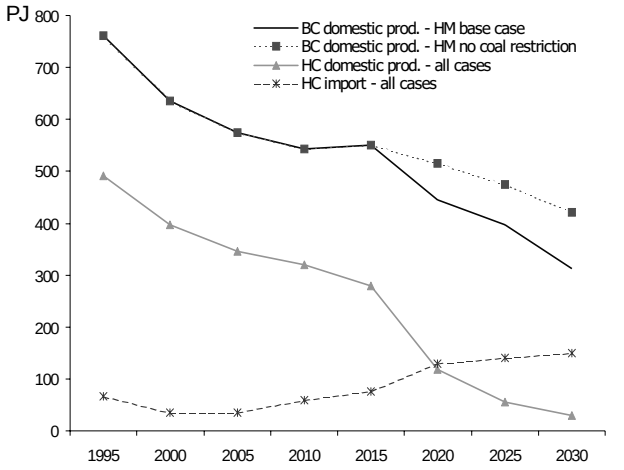
Prolonging Domestic Coal Production

Although in recent years its share has decreased significantly, domestic coal is still the dominant energy carrier in the Czech Republic. In the current Czech energy policy, geographical restrictions to coal mining have been introduced for environmental reasons, which would lead to a further decrease of production capacity in the future. In the period 1995-2030 brown and hard coal production capacity will decrease by more than 50% and more than 90% respectively (see Figure 2).

Since coal prices are expected to remain lower than natural gas prices (environmental externalities are not taken into account), the switch to natural gas in the power and heat production is limited. In central electricity production, the share of coal diminishes and is replaced by nuclear power. Commissioning the Temelin nuclear power plant and retrofitting the Dukovany nuclear power plant increases the share of nuclear power in public electricity production, leaving fewer opportunities for maintaining coal-fired public power production. New coal-fired technologies, in particular fluidised bed combustion, will replace conventional thermal coal-fired technologies, of which a large part will have to be decommissioned around the year 2015. The share of combined heat and power production increases strongly in industrial heat and power production as well as in district heating.

If the current coal-mining restrictions are abolished, relatively more brown coal is used in electricity and heat production. In central electricity production, condensing hard and brown coal power plants maintain a higher share than in the base cases (see Figure 2). Existing coal-fired plants are used at full capacity throughout the whole planning period and conventional plants are retrofitted, partly to fluidised bed combustion plants.

Figure 2
Development domestic brown coal (BC) and hard coal production (HC), and hard coal imports, with and without coal-mining restrictions (HM scenario)



The Role of Nuclear Power

If both the lifetime of the Dukovany NPP are extended till the year 2030 and the Temelin NPP is commissioned as planned, the share of nuclear power in public electricity production increases from 25% in 1995 to about 50% in 2030. The Temelin nuclear power plant will partly replace the production of existing coal fired plants. If nuclear power is phased out, the amount of gas-fired power production (combined-cycle technology) increases, which results in a further increase of gas imports. If, in addition, the coal-mining restrictions are abolished, part of nuclear power production is taken over by domestic coal-fired power production.

As a part of the strategy focused on the reduction of natural gas import dependency and self-sufficiency in power production, a further increase of nuclear power has been analysed. In this case, due to the lack of domestic coal resources and restrictions on net power import, the most cost efficient option is commissioning an additional nuclear unit of 600 MW around the year 2030. Nevertheless, additional investigations are needed as this can seriously diminish the necessary load flexibility of power supplies and should be politically acceptable.

Import Dependency and the Role of Natural Gas

One of the main reasons to build new nuclear power is to reduce the future import dependency of the Czech Republic. Whereas currently the import dependency is very low (17%), it is expected that this will increase significantly in the next decades, even to over 50% when nuclear power capacity is not expanded and domestic coal-mining restrictions are not abolished. The largest contribution to increased imports are the large increases in gas imports, supported by continuing oil imports and even small increases in coal imports. The costs of energy imports increase in absolute terms, but in relative terms – as a share of GDP - will remain at the current level of around 5%.

The share of imported natural gas in the TPER has constantly increased in the Czech Republic over the last years, from 16% in 1995 to 18% in 1997. It is assumed that the contracts for Russian and Norwegian gas will last until

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Czech Republic *(continued from page 5)*

2030. In addition, new contracts become available on the mid-term. As a result, the share of natural gas will continue to increase strongly. The largest increase occurs after the year 2015, when many coal-fired power plants will be decommissioned. The increase in imports are the highest in the HM and FO scenarios as result of the higher economic growth and the relatively low gas prices. Although the average rate of increase of gas imports in the period up to 2015 (3%/year) seems incredibly high, it is good to realise that this is still much lower than the rate of increase in recent years, and, therefore, not unfeasible. The resulting relatively high share of gas in total energy supply in the year 2030 (up to 50%) could be a threat to diversity of energy supply. Maintaining the role of nuclear power would keep the share of gas on a much lower level (around 35%).

Large gas imports will lower the security of supply where import dependency is concerned. On the other hand, the resulting larger fuel diversification positively supports the security of supply. With large gas imports diversification of supplier is important. The increase in gas imports would require significant investments in the transport infrastructure. These costs have been considered in the analysis.

The Development of CO_2 Emissions

Several strategies are possible to reduce CO_2-emissions: promotion of energy efficiency in end-use ('energy conservation'), promotion of renewable energy, increased efficiency in energy supply, and fuel switching. All four options are considered in the analysis. Apart from reducing CO_2 emissions, these options have other important benefits, in particular the reduction of SO_2 and NO_X emissions.

Energy-related CO_2-emissions in 1995 have decreased by 24% compared to 1990. Therefore, the Kyoto Protocol (8% reduction of greenhouse gas emissions in 2008-2012, compared to the 1990 level) seems relatively easy to achieve. However, further reduction of emissions may be necessary. Figure 3 shows the development of total energy-related CO_2-emissions in the period 1995-2030 for the three scenarios with nuclear power and with current coal-mining restrictions. The results indicate that CO_2-emissions could largely decrease if all cost-effective measures are implemented. The growth in TPER will cause a growth of CO_2 emissions. However, the use of nuclear power in both the Dukovany and Temelin plants significantly reduces CO_2 emissions. On the longer term, the decrease in coal consumption and increase in gas consumption will further reduce the emissions.

Abolishing the restricting on coal mining will lead to moderately higher CO_2 emissions beyond the year 2010 (+4% in the year 2030). A nuclear phase-out will increase CO_2 emissions with 7% in the year 2030. This is the result of the limited share of nuclear in the primary energy balance as well as the fact that nuclear in the policy case is mainly replaced by the low carbon energy carrier natural gas.

Renewable Energy

The currently low share of renewables in TPER (1.5%) could increase to around 4% in 2010 and 7% in 2030 if large additional policy efforts are taken. Biomass and waste have the largest potential, up to 100 PJ in the year 2030. The potential of wind power is small, only a small market share is gained. Extension of hydropower and installation of solar thermal systems and solar photovoltaic capacity is not cost-effective without additional promotion measures. Figure 4 shows the potential development of renewables, with other renewables comprising wind power and hydropower. For further information on the potential of renewable energy in the Czech Republic, the market barriers and promotion policy see [3].

Figure 3
Total CO_2-emissions 1995-2030 in percentage of 1990. The historical time series 1990-1995 has been added.

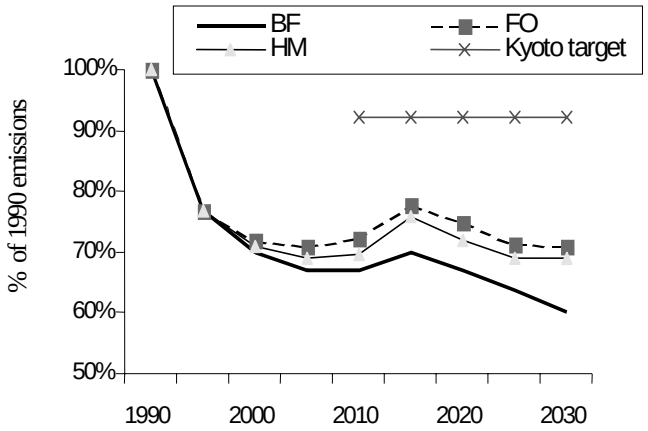
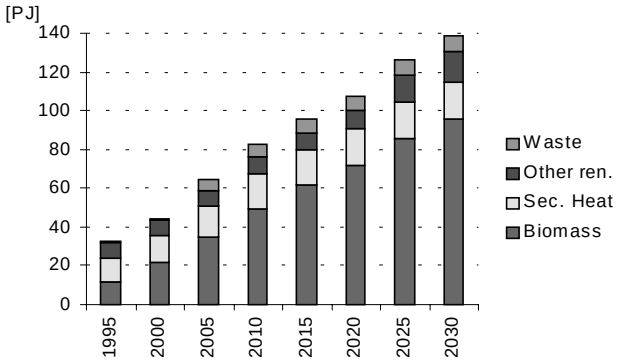


Figure 4
Development of renewables, 1995-2030



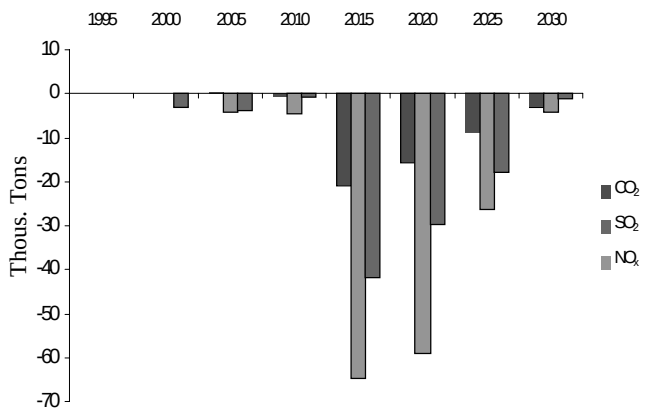
Energy Taxation

Introduction of an environmental tax in the form of a carbon tax could significantly support the increase of energy efficiency in both energy supply and end-use, thereby significantly reducing emissions, particularly CO_2 emissions. The latest tax scheme as proposed by the Ministry of Environment starts from the year 2010 and gradually increases tax levels till the year 2025. These taxes, that will effectively double energy prices on the long term, could result in additional decreases in emissions as is shown in Figure 5. TPER in the period 2015-2020 will decrease by 200 PJ as a result of the increase in energy efficiency, induced by higher end-use prices.

The direct impact on renewable energy production, however, is limited in the short-term, because of the limited technical potential and the limited cost-effectiveness. The tax will increase end-use consumer prices, since the production and distribution companies will pass on the increased fuel

costs to their customers. Furthermore, if the government decides to compensate these consumers by partly subsidising the price rises, governmental expenditures will rise accordingly.

Figure 5
Reduction of emissions after introduction of a carbon tax



Conclusions

The results of analysis for the period 1995-2030 of energy supply and demand in the Czech Republic lead to the following conclusions:

- Average annual economic growth ranges between 1.9 and 3.3%.
- Total primary energy requirements increase from 1750 PJ in 1995 to around 2000 PJ if all cost-effective energy measures are implemented. If not, total requirements are significantly higher.
- The economic potential of end-use energy savings is around 20% of total primary energy demand in the period 2000-2030.
- The structure of energy requirements will change significantly. Coal will largely be replaced by natural gas and partly by nuclear power (except in case of a phase-out of nuclear power).
- The share of imported gas increases largely up to 3% per year (in the non-nuclear case). Diversification of supplier should have high priority.
- If coal-mining restrictions are not abolished, the available domestic hard coal and brown coal production capacities reduce to 30 million tons in 2030. Otherwise, domestic coal production capacity will be 43.5 million tons in 2030.
- Prolonging the lifetime of the Dukovany nuclear power plant and commissioning the Temelin nuclear power plant as planned will increase the share of nuclear power in public power production to around 50%.
- Import dependency will increase to over 50% if coal-mining restrictions are kept in place and nuclear power capacity is not expanded.
- The long-term cost-effective potential of combined heat and power generation is around 35% of total electricity production.
- The Kyoto target on reduction of greenhouse gases could be met without large difficulties. Beyond 2010, CO_2 emissions could remain constant or even decrease if all cost-effective measures are implemented.
- Renewable energy could gain a market share of 4% in 2010 and 7% in 2010 if appropriate policy measures are taken to tackle market barriers.
- Energy taxation would, in the long-run, double end-use prices and largely increase energy efficiency. The impact on promotion of renewable energy is only small, because of limited potentials and limited cost-effectiveness.

Footnote

[1] This project was financed by the Synergy programme of the European Commission, the Dutch Ministry of Economic Affairs, the Czech Ministry of Industry and Trade, the Czech Ministry of Environment, the Czech union of employers in the power and heat sector, the Czech union of employers in the coal and oil sector and the Czech gas union.

References

[1] Voogt, M. et al (1999), "Development of integrated scenarios Czech Republic, Final report." ECN-CX—99-080, Petten, Netherlands (confidential).

[2] European Commission (1996), "European Energy to 2020. A scenario approach," *Energy in Europe*, special issue spring 1996, Directorate General for Energy (DG XVII), Luxembourg, 1996.

[3] ECN, SRCI CS, et al (1999). "National Energy Efficiency Study Czech Republic." ECN-C—99-063, ECN-C—99-064, ECN-C—99-065. Netherlands Energy Research Foundation ECN, Petten, Netherlands. August 1999.

First Austrian-Czech-German Conference on Energy Market Liberalization in Central and Eastern Europe

The first Austrian-Czech-German Affiliates IAEE Conference in September 1999 was dedicated to Energy Market Liberalization in Central and Eastern Europe. The conference was organized by the Czech Technical University in Prague. Prague is a city with secular political, cultural, scientific and technological traditions. Central and Eastern Europe, once under a totalitarian regime, now has the opportunity to be part of the European Union, as a resulf of political changes in 1989. The conference contributed to the change from a centrally planned energy system to a liberal energy market.

More than 80 participants from eight European countries attended. These participants had a chance to take part in 40 different lectures. In the plenary session, the Czech participants gained an overview about accessing the electricity grid in different countries (Wolfgang Pfaffenberger, UNI Bremen), gas liberalization (F. van Oostvoorn, ECN - Eneragy Research Foundation, Netherlands), backlashes in liberalized electricity markets (Reinhard Haas, Institute of Energy Economics, Vienna University of Technology), and an analysis of stranded costs. This session also included a discussion of the pros and cons of renewables in a liberalized power market, and the feasibility of biomass in energy projects.

In turn, the EU participants received information regarding the liberalization process in the Czech Republic. The new Czech Energy Law (Pavel Brychta, MPO) was presented, as well as preliminary activity leading toward liberalization of the Czech Central Dispatch Center (Miroslav Marvan, UED) future trading with system services (Ludmila Petranova, CEPS a.s.), and the role of the Czech Energy Agency (Jiri

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Austrian-Czech-German Conference *(continued from page 7)*

Barton, CEA) were presented. In addition, the opinions of independent Czech organizations on deregulation in the Czech Republic (Jiri Schwarz, Liberalni Institut) and on strategic marketing and risk management under new conditions (Ivan Benes, CityPlan spol. s r.o.) were presented.

For the next part of the conference, the participants were divided into several groups. One was a cogeneration lecture with representatives from cogeneration plants and district heating companies (Miloslav Decker, Elektrarny Opatovice a.s., Frantisek Samek, TEPO Kladno s.r.o., Vaclav Klicnik, Teplarny Brno a.s., Milan Bambuch, Zasobovani teplem Vsetin a.s., Miloslav Krejcu, Teplarenske sdruzeni).

Next on the agenda was another plenary session dedicated to discussion of detailed experiences from the liberalization of the European gas and power market. Among topics addressed were influences on power production costs (Herbert Lechner, EVA, The Austian Energy Agency), influences on power production technology (Jan Kartak, CityPlan spol. s r.o.), the problem of ancillary services (Pavel Becko, Dept. of Power Plants and Energy Economics, Poland), the problem of distributed power production (r. Madlener, A. Wohlgemuth, IHS Carinthia), the new market and industry structure in the Bulgarian power sector (Konstantin Petrov, KEMA Consulting GmbH), Tedom's trade experience in Spain (Josef Jelecek, TEDOM s.r.o.) and the new competition-based support schemes for electricity generation from renewable energy sources (Isabel Kuhn, Center for European Economic Research - ZEW, Germany).

Another session was dedicated to lecture on tools developed to facilitate the energy business, particularly the regular financial analysis of the Czech energy sector (Jan Vondras, Invicta Bohemica s. r.o.) technology for energy trading (Peter Ruggo, Blue Moon Energy GmbH, Bremen, Germany) and cost modeling for financial control (Libor Holub, CityPlan spol. s r.o.).

Last but not least. a session was devoted to the environment and global climate change. The impact of energy policy decisions on energy supply and demand in the Czech Republic (Miroslav Maly, SRC International CS s.r.o.), climate protection policy in the accessed countries (Lutz Mez, Free University of Berlin), Poland's climate protection policy (Sybille Tempel, Free University of Berlin), energy and emissions in Slovenia after Kyoto (Jurij Modic, Ljubljana, Slovenia), the CO_2 tax in Slovenia (M.G.Tomsic, A. Urbancic, Institute "Josef Stefan", Ljubljana, Slovenia), and approximating EU legislation in the area of energy and environment (Michael Krug, Free University of Berlin).

The conference was very fruitful and created further personal and professional relationships. The key message of the First Austrian-Czech-German Conference on Energy Market Liberalization in Central and Eastern Europe can be summarized by ten points:

- Globalization of the world economy causes liberalization of energy markets, which demand strategic and innovative thinking.
- The energy companies are transformed from state to private entities where the manager's responsibility for the safety of the energy supply are insuffiecient criteron.
- Energy for the third millenium requires new technology and new ideas.
- Future success depends on unbundling accounts but bundling services.
- The new criterion of managers is added value, successful marketing and financial control resulting in higher shareholder value.
- Regulation "cost plus" is replaced by the market, where cost must be adjusted to the price, not vice versa.
- The full cost can be saved before investment. The investment must make a profit, otherwise, it is stranded.
- Stranded investment due to government decision after EU directive issue is unlikely to be compensated.
- Ignorance of EU liberal directives will be punished by stranded cost encumbered by the owner of the utility, not the customer.
- The current price war at the EU power market can support only strong companies. The weak companies are captured sooner or later.

Ivan Benes

Note on Indian Affiliate of the IAEE

The Indian Association for Energy and Environmental Economics (IAEEE) was started as the Indian chapter of the International Association for Energy Economics in 1990. The Indian chapter is represented by Dr. R. K. Pachauri (President, IAEEE).

The IAEEE comprises individuals from diverse fields. Although almost 50% of the members have generally been researchers and academicians, close to 30% of its members have been from private organizations and consultancy groups. Representatives from government organizations have also taken keen interest in the association and individual members have often continued their association even after retirement from offices held during service.

The IAEEE office functions as a facilitator to the IAEE headquarters in associating with its members and disseminating information of global IAEE activities to its members.

Apart from its role as a co-ordinating and facilitating node of the IAEE, the Indian Association for Energy and Environmental Economics has also hosted Annual International Conferences of the IAEE in India in 1990 & 1997.

The Indian Association of Energy and Environmental Economics (IAEEE), in association with the Tata Energy Research Institute (TERI), organized the 20th Annual International Conference of the IAEE during January 22-24, 1997 around the major theme, "Energy and Economic Growth - Is Sustainable Growth Possible?" An IAEEE General Membership Meeting was also scheduled during the same time. The Conference was well attended by more than 250 people from various countries and from varied backgrounds.

Among recent work of larger current interest in the area of sustainable energy and resource utilization in the country is the DISHA document prepared by the Tata Energy Research Institute (TERI). DISHA stands for Directions, Innovations, and Strategies for Harnessing Action and was taken up as the sequel to an earlier study titled - GREEN India 2047- (Growth with Resource Enhancement of Environment and Nature). The focus of DISHA is to develop and disseminate the elements of a strategy by which India can reverse the damage done to its natural resources in the first 50 years of independence, and arrive at a sustainable structure before the next 50 years.

Ritu Mathur

Italian Association of
Energy Economists

European Commission
Directorate General Energy

2nd International Conference On

Energy Efficiency in Household Appliances and Lighting

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

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

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

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

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

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

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

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

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

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

For further information or registration details, please contact:

CRISTIANA ABBATE
A.I.E.E. Conference Secretariat
Via Giorgio Vasari, 4 - 00196 Rome, Italy
Phone (3906) 32 50 16 10 - (3906) 322 73 67
Fax (3906) 323 4921
e-mail: aieeconference@mclink.it

Will There Always be Too Many Refineries?

*By W. Laney Littlejohn**

Even the most casual observer of the petroleum refining industry will have noticed that, for years, perhaps even a couple of decades, returns in the industry as a whole have been quite low relative to most measures of the cost of capital. Most refiners would probably regard this as a gross understatement and would prefer terms like "abysmal" or "disastrous" to describe the economic condition of the industry. Only a year ago, at the 1999 NPRA meeting in San Antonio, NPRA Chairman Robert H. Campbell (Chairman and CEO of Sun Co., Inc.) took advantage of the previous day's motion picture Academy Award announcements by remarking, "If there had been a category for the longest running 'horror show,' the U. S. refining industry would have been on the short list of favorites to win the Oscar."

Except for short periods of time associated with unusual weather conditions or temporary disruptions of one sort or another, gross refining margins (the difference between sale value of products and the cost of crude oil) have been far below levels which would provide economic justification for the construction of refining capacity. Despite this, construction of new refineries has continued as has expansion of existing refineries. The obvious question is, "Why?"

The refining industry, like other process industries, is characterized by lumpy investment with lagged effect. Economies of scale dictate that new capacity be brought onstream in sizable lumps; engineering and construction requirements are such that three or four years may elapse between the decision to build and the date a facility comes on line. In such an industry, it seems reasonable to expect cyclical behavior of margins and profits. When profits are high, investment in new capacity is attractive, and companies initiate construction of new plants. When these plants are built, the industry suddenly finds itself faced with excess capacity, margins decline toward the level of variable operating costs, and profits decline accordingly. Investment in new capacity then comes to a halt until such time as the combination of market growth and retirement of existing plants is sufficient to remove the excess capacity condition. Then the cycle begins again.

Lumps and lags, however, do not explain the persistence of low returns in petroleum refining. Nor do they explain why worldwide refining capacity has been rising despite low returns. Something else must be afoot. Perhaps there is something fundamentally amiss in the process by which refiners reach decisions to add capacity. Perhaps there are peculiar factors impinging upon the decision process which create an inherent tendency toward excess capacity. If so, there will always be too many refineries.

In what follows, we examine these questions with a combination of casual empiricism and rocking-chair cogitation. We present no data, graphs or charts, and we fit no equations, for we do not wish to reach conclusions that might be dependent upon the peculiarities of the history of the oil industry in the 1980s and 1990s. Only by examining the investment decision process itself can we hope to shed light on the question posed by the title, "Will there always be too many refineries?"

* W. Laney Littlejohn is with Littlejohn Associates, Houston, TX. He can be reached at laneylittlejohn@compuserve.com

Capacity Data – Inherently Flawed

The first order of business in the typical evaluation of a potential refining investment is to determine whether there appears to be "room" for another refinery. One typically does so by comparing projections of product demand to existing capacity, plus capacity under construction, plus some portion (which is conveniently subject to the analyst's discretion) of announced refinery projects which are not yet underway.

Unfortunately, the capacity data employed for the purpose are fundamentally flawed. They are systematically biased downward by several factors: (1) overdesign, (2) "capacity creep", and (3) "upgrade expansion."

By "overdesign," we mean simply that the actual capacity of a refinery, or its units separately, is substantially in excess of its stated or nameplate capacity. Some of the reasons are simple and obvious. No engineer instructed to design a 200 mbd (thousand barrels per day) refinery is going to risk a design which might achieve only 190. Accordingly, he builds in some slack in the basic design, then adds a bit more by making an overly liberal allowance for down time. Additionally, in the interests of flexibility of crude slate, the designer may want to make sure that the unit can achieve its nameplate capacity with crude oils of different gravities. Then, if the refinery runs crudes or blends in the middle of the design range, throughput well above nameplate can be achieved. Thus, the day a refinery is built, its capacity is likely to be well in excess of the nominal capacity (which is reported to governments, trade associations, and journals and then used by planners).

After a refinery is built, capacity is subject to "creep." During operation at or near capacity, "bottlenecks" are discovered, some of which can be removed by relatively minor and inexpensive modifications. Subsequent to one "debottlenecking" action, another is discovered and removed. Capacity creeps up, slowly but inexorably. But the capacity numbers used by industry observers and planners are not adjusted.

Finally, there is what we call the "upgrade expansion" phenomenon. Changes in product specifications, changes in the relative prices of different products, or changes in the availability and relative prices of different crude oils may induce or force the execution of refinery "upgrade" projects, such as adding cracking capacity, various sorts of reforming units, or desulfurization. Though these are commonly stated to be upgrades rather than expansions, they are seldom executed without positive impact on the refinery's maximum throughput.

The result of these phenomena is obvious. Refinery planners and analysts start into the problem with a systematically overstated estimate of the market justification for future capacity.

Strategic Investments

It is not infrequent that one hears an investment which is otherwise questionable described as "strategic." In instances where refineries have been so described, we have never been able to figure out what "strategy" was being implemented by the "strategic" investment, partnership, or alliance. Accordingly, we have reached the conclusion that "strategic" is a synonym for "it does not make economic sense but we want to do it anyway."

Vertical Integration

Oil producers, both companies and countries, frequently

entertain the notion that integration into the downstream (refining and marketing) offers benefits over and above the profitability of the refining and marketing activity themselves. Accordingly, they may be willing to pay a premium for refining assets or undertake refinery projects which, in and of themselves, appear to provide an unacceptably low rate of return.

The benefits of vertical integration are elusive and probably illusory. The notion of a "guaranteed outlet for crude oil," which has led more than one producing nation into the downstream is, by and large, a red herring. Crude oil is a fungible commodity, the demand for which is invariant with respect to the ownership of refineries. Consequently, the combinations of prices and output available to the crude oil exporter are not changed one barrel by the acquisition of refineries.

Portfolio theorists and investment bankers (who like to earn large sums from mergers and acquisitions) tell us that crude oil prices and refining margins are negatively correlated. Adding refining assets to a crude producer's folio reduces the variance of income from the portfolio, so the producer should be willing to pay a premium for refining assets. We are yet to see a convincing empirical demonstration of this effect. Additionally, given that the variance of crude oil prices is several times the variance of refining margins, it is not clear that the large producer can gain very much by restructuring his portfolio.

Traditional theory of vertical integration suggests that it has value and occurs because it reduces transactions costs between the various segments of the business. However, modern communications and trading practices have resulted in transactions costs in crude markets which are probably lower than the managerial costs associated with vertical integration, so this argument is without compelling force.

In certain situations, the notion of asset specificity may provide legitimate economic foundation for vertical integration, but such arguments are limited to a few cases, such as extremely heavy or otherwise unusual crude oils which require specialized refining facilities.

Nevertheless, and whatever the true merits, perceived benefits from vertical integration serve to act as another force toward excess investment in refining capacity.

Refineries in Developing Nations

Decisions to build refineries in oil-importing developing nations usually involve governments, which almost necessarily implies a bias toward building refineries that do not make economic sense. (If they did make economic sense, the government would not need to be involved in the first place.) Governmental objectives related to economic growth and employment are the more obvious factors here, but one will even hear the argument that building refineries will save foreign exchange by substituting crude oil imports for more expensive product imports. Issues of national security may even come onto the table; it is "riskier" to be an importer of products than an importer of crude oil. To put some icing on the cake, governments may adopt regulatory schemes designed to protect domestic refineries, higher import duties on products than on crude oil, or even outright prohibition of product imports. (Some of these considerations are not limited to developing nations: witness Japan).

Even if a refinery of some sort could be economically justified, there are biases toward building too big and too soon. Official forecasts of economic growth and the associated growth in product consumption are usually optimistic. More seriously, the size of the refinery is usually chosen based on domestic requirements for one or two products (e.g., middle distillates); excess output of other products (e.g., naphtha and fuel oil) can be exported. Finally, considerations of economies of scale are likely to lead decision makers to increase the size even further; products in excess of domestic requirements can be exported.

If several countries in a region behave in this fashion, the outcome is obvious. Each nation winds up covering its own domestic product requirements and trying to export to the others. Readers will probably recognize this as a reasonable description of the current situation in South and Southeast Asia.

Animal Spirits

Economists like to think of investment decisions as being based on carefully executed net present value calculations, but there are good reasons to believe that spontaneous optimism plays the larger role. In the words of John Maynard Keynes:

> "Most, probably, of our decisions to do something positive, the full consequences of which will be drawn out over many days to come, can only be taken as a result of animal spirits – of a spontaneous urge to action rather than inaction, and not as the outcome of a weighted average of quantitative benefits multiplied by quantitative probabilities. Enterprise only pretends to itself to be mainly actuated by the statements in its own prospectus, however candid and sincere. Only a little more than an expedition to the South Pole, is it based on an exact calculation of benefits to come."
>
> "If we build it they will come."

An aside is in order. We do not wish to imply that "animal spirits" are not socially useful. For optimists are the portion of society which make decisions to build things, and build them. If economists were entrusted with investment decisions, we would all (but many fewer of us) still be living in mud huts.

Merry-go-round Economics

In the corporate world (and even in some governmental circles), animal spirits are not allowed to run totally unchecked. People who sit in board rooms still want to see numbers – cash flow projections, net present values, internal rates of return, and sensitivity analyses – before putting the stamp of approval on a proposal to build a refinery. So it is worth while to examine how this is done.

Projecting cash flows for a proposed refinery requires that one project crude oil and product prices or, more relevant, differences between crude oil prices and product prices. This is typically done in the following fashion. It is assumed that, in the long run, prices of refined products will exceed crude oil prices by an amount sufficient to justify building and operating refineries, i.e., that the margin between refined product sales revenues and crude costs will be enough to cover operating costs plus capital costs, including an appropriate rate of return. This assumption, together with estimates of the cost of building and operating various process units, is then used to calculate a set of "long-run" differences between the prices of various products and crude oil. This, of

(continued on page 12)

Too Many Refineries? *(continued from page 11)*

course, amounts to assuming that refining will be profitable, and then calculating the prices required to make it profitable.

Current (at the time of projection) price differentials may be smaller than this (because of excess capacity in the industry), but this need not be a matter of concern. At the feasibility study stage, a refinery is still four years or more away from operation. Capacity data (discussed above) and consumption forecasts will almost always show a "shortage" of capacity by the time the refinery under study comes onstream. An assumption that product price differentials will widen to the long-run level is justified.

The product and crude price projections derived above are then used in the discounted cash flow analysis of the project under study. Voilà. The project turns out to be profitable. It turns out to have the same internal rate of return that was assumed to project prices in the first place.

The circularity of this reasoning is so obvious that little further comment is required. Refinery projects appear profitable because they are assumed to be profitable.

Summary and Conclusions

The above description of the decision-making process may be summarized as follows. Animal spirits provide the basic motivating force for building refineries. Justification is provided by fundamentally flawed capacity data and projections, supplemented by questionable arguments regarding the benefits of vertical integration, "strategic" considerations and, in the case of developing nations, vague ideas about the contribution of refineries to economic growth, employment and trade balances. Finally, decisions to build are made based on economic analysis performed in a fashion which guarantees apparent profitability.

Yes, Virginia, there will always be too many refineries.

A Note from the Norwegian Affiliate

The Norwegian Affiliate currently comprises around 100 active members. Over the past year the affiliate has organised four half day seminars covering selected issues of the energy scene.

- In June the seminar covered the restructuring of the oil industry, implications for the Norwegian oil industry, the Norwegian authorities and the service industry. Kris Jacobsen of the Norwegian brokerage house, Pareto, provided the financial analyst perspective, while Karen Sund of the Norwegian consultancy ECON provided the societal perspective.
- In October the seminar looked at European gas prices and breaking the oil link. Gas and power, one industry or two. Presentations were made by Peter Hughes and Simon Blakey of CERA.
- In December the seminar covered reflections following the presentation of the Norwegian white paper on greenhouse gas policies. Introductory observations from COP 5, were made by Harald Dovland Norwegian Ministry of the Environment. The leader of the committee followed with a presentation summarising the recommendations, before Halfdan Wiig director of the Norwegian consultancy INSA concluded by drawing the implications for energy markets and investment risks.
- In March the subject was how to handle the growing Norwegian power deficiency. Research Director Torstein Bye from Statistics Norway introduced by pointing to the large amount of excess capacity in continental Europe that can easily be transmitted through existing cables. The forward prices on the Nordic power exchange, do not show any signs of reaching levels that justify new capacity additions within the next 6-10 years. While agreeing with the current outlook concerning the need for new domestic expansions, Lars Hjermann, the Director of the Norwegian Gas Power company Naturkraft, pointed to the long lead times associated with significant capacity expansions. It would, therefore, be imprudent not to start making the necessary preparations

The affiliate is currently organising the first European IAEE conference on the topic of integration of the European Energy markets. High level speakers include Mr. Olav Fjell, CEO of Statoil, Mr. James Hoecker, chairman of the FERC, Professor Victor Norman of the Norwegian school of Economics and Business Administration, Professor William Hogan of Harvard University, Professor Richard Green of the University of Hull and Professor Frank A Wolak of Stanford University. For more information please refer to the internet site of the Foundation for Research in Economics and Business Administration, http://www.snf.no

The members of the board of the Norwegian affiliate of the IAEE comprise representatives of various elements of the Norwegian energy sector, resulting from a long term strategy of bringing together a wide range of interests with the aim of enhancing the exchange of insights and ideas in an informal atmosphere. Board members include:

- Øystein Håland: Chairman. Currently manager of the department of economic evaluation in Statoil's European Gas business. His career in Statoil includes a 5 year experience with corporate strategy and 2 years as a petroleum economist in Statoil's E&P business. oeyh@statoil.com
- Tore Nilsson, Vice Chairman, Senior Associate with CERA Norway.tnilsson@cera.com
- Ellen Cathrine Rasmussen, treasurer, gas marketer in Norsk Hydro. Previous posts include 4 years with the Ministry of Industry and Trade in Norway and 2 years with Statistics Norway. ellen.cathrine.rasmussen@hydro.com
- Gro Anunskaas, member. Assistant Director General, Department of Oil and Energy, Norway. 15 years experience with the ministry. gro.anunskaas@oed.dep.telemax.no
- Kjell Berger, member. Chief Economist in Commercial and Marketing division of the Norwegian power production company Statkraft. Previous positions include 3 years with the Norwegian consultancy firm ECON and 11 years with Statistics Norway. kjell.berger@statkraft.no
- Balbir Singh, member. Research Economist with the foundation for research in economics and business administration. balbir.singh@snf.no
- Kristian Tangen, member. Researcher with the Fridtjof Nansen Institute. krist-t@online.no
- Øystein Kristianssen, member. Chief Engineer with the Norwegian Petroleum Directorate. oystein.kristiansen@npd.no

Øystein Håland

IAEE NORGE

Norwegian Association for Energy Economics

SNF

Foundation for Research in Economics and Business Administration

ANNUAL EUROPEAN ENERGY CONFERENCE 2000

Bergen, Norway August 31-September 1, 2000

Towards an Integrated European Energy Market

The time is appropriate to draw on the lessons learned so far and focus on the market, network and environmental issues which will influence the realisation of an Integrated European Energy Market in the coming years. This conference will consider: liberalisation of electricity and natural gas markets in Europe; interconnector access and pricing; alternative models of competitive electricity markets; environmental policies when energy markets are liberalised; energy in Eastern Europe after a decade of transition; the outlook for North Sea oil and gas; and the future structure of the European energy industry.

Confirmed Speakers:

The Honorable James Hoecker, *Chairman,* U.S. Federal Energy Regulatory Commission

Olav Fjell, *President and Chief Executive Officer*, Statoil

Victor D. Norman, *Professor,* Norwegian School of Economics and Business Administration

Richard Green, *Professor,* University of Hull

William W. Hogan, *Professor*, Harvard University

Frank A. Wolak, *Professor*, Stanford University

Representative from the Royal Ministry of Petroleum and Energy, Norway

Representative from the European Commission, Competition Directorate-General

Confirmed session organisers:

Torstein A. Bye, *Research Director*, Central Bureau of Statistics, Oslo

Denny Ellerman, *Senior Lecturer*, MIT

Dominique Finon, *Director,* IEPE, University of Grenoble

Frits van Oostvoorn, *Account Manager European Policy Studies,* Netherlands Energy Research Foundation

Marian Radetzki, *Professor*, SNS Energy

Balbir Singh, *Research Economist*, Foundation for Research in Economics and Business Administration

Bergen has been selected as one of Europe's cultural cities for the year 2000. It is a small city (250,000 inhabitants) with long traditions in establishing international networks. Today Bergen is one of the major centres for the North Sea offshore oil and gas exploration and development. Bergen is situated on the West Coast of Norway, a region known for its waterfalls and fjords. The topography and the coastal climate provide this region with rich hydropower resources making the region a major source of power in the Nordic electricity system.

Einar Hope	Lars Bergman	Balbir Singh
General Organising Committee	Programme Committee	Local Organising Committee

Foundation for Research in Economics and Business Administration - SNF
Breiviksvn. 40
NO-5045 Bergen
Ph:(47) 55 959500, Fax (47) 55 959439
Online registration available at www.snf.no (IAEE/SNF Conference)

Can The Oil Price Remain High?

*By Mamdouh G. Salameh**

The oil industry experienced in 1998 the worst oil price crash since 1986 with oil prices, in real terms, reaching levels not seen for 26 years. A barrel of Brent had been worth about $20/b in autumn 1997 but, by the end of 1998, its price had dropped to $10. Although industry observers had predicted a downturn in oil prices since early 1997, nevertheless the extent of the fall caught most players and experts by surprise.

In March 1999, cutbacks in production by the major producing countries pushed the oil price higher. Is this increase merely temporary, prior to prices weakening again, or will it lead to prices stabilizing close to current levels? The following factors will determine whether or not current oil prices are sustainable:

- The global oil demand
- OPEC's discipline
- Iraq's oil exports
- Reserve depletion rate
- New oil discovery rates

Table 1
World Oil Demand
(mbd)

Regions	1996	1997	1998	1999	2000	2005	2010
North America	22.27	22.71	23.20	23.70	23.99	25.84	27.84
Central & South America	4.30	4.48	4.90	4.90	4.94	5.87	6.97
Europe	15.61	15.79	16.12	16.36	16.67	17.96	19.35
CIS	4.36	4.34	4.26	4.02	4.12	4.55	5.15
Middle East	4.01	4.03	4.12	4.19	4.31	5.00	5.80
Africa	2.26	2.32	2.40	2.41	2.47	2.79	3.23
Asia-Pacific	18.93	19.80	19.38	19.71	20.39	23.60	28.03
World	71.74	73.47	74.38	75.29	76.89	85.61	96.37

Sources: IEA / BP Amoco Statistical Review of World Energy, June 1999 / East-West Center, Honolulu, USA / Author's Projections.

Global Oil demand

World oil demand is now rising at about 2.4% a year and would have been higher but for the economic crisis which hit the Asia-Pacific region during 1997-98. The Asian crisis which spread to other regions such as Russia and Latin America, proved an effective brake on demand. While consumption of oil products in the Asia-Pacific region had grown at over 5% per annum for several years, it actually declined in 1998. Growth has resumed in 1999 but at a lower level than before (see Table 1).

Demand for petroleum products should continue to grow reaching 76.89 mbd this year and rising to a projected 85.61 mbd by 2005 and 96.37 mbd by 2010 with Middle East producers having to meet the major part of the additional demand. However, that will depend on the necessary investment being made to expand production capacity.

There is no doubt that production cutbacks by OPEC and an improving rate of compliance by its members have contributed to the oil price surge and led to an enormous stock draw of 2.9 mbd in the fourth quarter of 1999. However, the real reason for the strength of the oil price is the present healthy state of the global economy which grew in 1999 at 3% and is expected to grow this year by a projected 3.5%. The economic background remains good for oil. This has fuelled a growing global demand for oil projected to rise at a rate of 2.4% this year. When a country such as South Korea, which was crisis-stricken in 1998, increases its oil consumption in one year by 10% as it did in 1999, one can see why the oil price remains so strong.

OPEC's Discipline

In November1997 OPEC, in the expectation of certain demand growth, raised its production quotas by nearly 10%, from 25.03 mbd to 27.50 mbd from the first of January 1998, despite the fact that two months earlier, Iraq's oil exports had reached 1.3 mbd and OPEC's production was rising.

However, OPEC's decision which coincided with a very mild winter, growing Iraqi crude oil exports and the continuing crisis in Asia, soon led to a sharp decrease in oil prices. Matters were made even worse by some members exceeding their quotas. In an attempt to curb the fall in prices, OPEC sought in spring 1998 to involve a number of non-OPEC producers in an effort to reduce crude oil production.

In March 1998, Saudi Arabia, Venezuela and Mexico concluded an agreement to reduce their production by 600,000 b/d. In addition, they urged other producing countries to take similar action, in order to reduce production by 1.5 to 2.0 mbd. OPEC members agreed voluntarily in March 1998 to cut production. Overall, the cut was more than 1 mbd, that is little less than 5% of the total quotas. Non-OPEC producers

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* Mamdouh G. Salameh is an international oil economist, a consultant to the World Bank in Washington D.C. and a technical expert of the United Nations Industrial Development Organization (UNIDO) in Vienna. He is Director of the Oil Market Consultancy Service in the UK and a member of the International Institute for Strategic Studies (IISS) in London.

[1] See footnotes at end of text.

such as Mexico, Oman, Norway, Egypt, Yemen and Russia also committed themselves to reduce output.

But, by April 1998, it became apparent that more cuts in production were needed to stop the downward slide in the oil price. So by June 1998, OPEC decided on further reductions totalling 1.355 mbd. Overall, from July 1998, OPEC had agreed to cuts amounting to 2.6 mbd.

In the event, up to the beginning of 1999 OPEC production only fell slightly, the cuts made by the ten member states excluding Iraq being largely offset by an increase in Iraq's output.

With world production giving a large surplus over the level of demand, prices continued to fall, reaching less than $10/b at the end of 1998. The position was aggravated by very high stock levels. At the end of September 1998, stocks of crude oil and products reached over 4 bb in the OECD countries alone, who only account for 60% of world demand.[1] Stock levels have been increasing since 1996 and did not start to fall until the end of 1998.

The consequences of this situation were dramatic, particularly for the producing countries. That is why the principal producers agreed to a further production cutback in March 1999 amounting to more than 5 mbd of which 4 mbd had been agreed to by OPEC countries. The reductions decided in March 1999 resulted in a marked increase in prices.

Although the positive impact of lower oil prices on the economies of the main consuming countries remains limited (the cost of energy barely representing 1% of their GDP), the magnitude of the fall in market prices over 1998 was a cause of great concern for the major exporters. In the Gulf countries, 1998 GDP fell by about 2%. OPEC oil revenues fell by $62 bn, or by 36% in 1998 from their 1997 level (see Table 2).

Table 2
OPEC Oil Revenues (US $ bn)

Country	1996	1997	1998	change 98/97
Algeria	9.1	9.3	5.9	-37%
Indonesia	5.7	5.3	3.0	-43%
Iran	18.7	18.1	11.2	-38%
Iraq	0.8	4.6	5.2	+13%
Kuwait	13.6	13.7	8.3	-40%
Libya	9.5	9.1	5.7	-37%
Nigeria	15.8	15.5	9.6	-38%
Qatar	4.0	5.2	3.6	-31%
Saudi Arabia	56.8	56.3	36.1	-36%
UAE	17.0	18.8	12.1	-36%
Venezuela	18.7	18.8	12.0	-36%
Total	169.7	174.7	112.7	-36%

Sources: OPEC / Center for Global Energy Studies (CGES), London / Petrostrategies.

Iraq's Oil Exports

The key player and driving force in the new geopolitics of oil could be Iraq. This is because once the UN sanctions are lifted, Iraq is determined to increase oil production to 6 mbd by 2005. Iraq is now willing to open up to outside investment by offering production-sharing contracts (PSCs) to would-be-investors. No other major Middle Eastern producer has been willing to do so. That Iraq is willing to do so suggests that it is desperate to increase production and that it will be willing to ignore the OPEC line.

Iraq has increased daily oil exports from 700,000 b/d in November 1997 to 2.2 mbd in 1999.[2] With a current production capacity of 3 mbd, Iraqi oil exports are projected to reach 2.45 mbd this year.

Because of rising oil demand from the Asia-Pacific region and OPEC's limiting of its production, the oil market has been very tight for almost a year. In this tight market, Iraq has become the enormously powerful "swing" producer - the only country willing and able to suddenly turn on or off its oil tap. In November 1999, Iraq pushed oil prices up almost $1 a barrel in a single day when it turned off its spigots to protest UN sanctions. This time, with oil inventories very low, any interruption in crude oil supply could cause prices to skyrocket.

Judging from reported increases in reserves worldwide, the excess of oil produced over demand now stands at about 700,000 b/d. If that much overproduction causes depression-level prices, what would happen if Iraq chose to withhold 2-3 mbd as it now could?

Although growing Iraqi oil exports have partly offset the production cuts agreed by OPEC and non-OPEC producers, it is doubtful as to whether they can exert as strong a downward pressure on the price of oil so as to cause a major drop.

Global Reserve Depletion Rate

Estimates at the end of 1999 indicate that there were just 935 bb of conventional oil yet-to-produce. What is common to all types of production is that peak production occurs at approximately the same time as the mid-point of total yield, except where production is artificially constrained by allocation arrangements.[3]

Different countries are at different stages of their depletion curves. Some are past their mid-point and in terminal decline, for example, the United States; some are close to mid-point, such as Norway and the UK. However, the five Gulf producers are at a very early stage of depletion and can exert a "swing" role, making up the difference between world demand and what others can supply. They can do this only until they themselves reach mid-point, probably by 2013.

It is predicted that the world's mid-point of depletion will come when 900-1,000 bb have been produced (half the ultimate reserves of 1,800-2,000 bb) which, with 865 bb already produced, will probably be in 2-5 years's time. Assuming this coincides with peak production, shortages could be expected on this basis to arrive sometime between 2001 and 2004. [4]

It can be argued, therefore, that the anticipation of shortages is bound to lead to a radical increase in the price of oil in the opening years of the new millennium. That would be likely to curb increases in demand, so that actual physical shortages could be delayed for a few years; but this delay will depend on the Middle East "swing" producers. However, by 2008 they will be supplying 50% of the world's needs and by 2013 will be close to the mid-point of their own depletion. Although much higher prices will cushion the effect, chronic shortages of conventional oil would be predicted to develop from around 2010 onwards. This raises the question as to how relaxed or concerned the oil industry should be about the fact that it has been depleting known reserves of around 1,034 bb at roughly 2.6%, or 27 bb, per annum.[5]

(continued on page 16)

Can The Oil Price Remain High? *(continued from page 15)*

New Oil Discovery Rates

Almost 90% of the world's conventional oil has been found. This time, an oil price crisis cannot be solved by bringing in fresh production from known basins awaiting development.

The widely held view that improved seismic surveying and seismic interpretation have improved drilling success rates, is not borne out by the 1998 figures. The 1998 success rate for exploration drilling (outside North America) was 29%, well down on the 38% level recorded in 1997.

The world is currently consuming 27 bb of oil a year on a rising trend, yet finding around 6 bb/year on a falling trend. It is essential to bear in mind that 70% of current oil production comes from fields more than 30 years old. Furthermore, peak discovery was in the 1960s despite the technological advances and massive drilling activity since then. On this basis, we are about to face a peak in production corresponding to intensive exploration 30 years ago.

The total global reserve addition of 7.6 bb in 1998 was slightly better than in recent years but still represents only 28% of the 27 bb produced in 1998. Over the last five years only 38% of global oil production has been replaced by new discoveries (see Table 3). According to Petroconsultants' 1999 World Petroleum report (WPT), the cumulative shortfall over the last five years amounted to 50 bb.[6]

Table 3
Crude Oil Reserve Additions, 1992 - 1998*
(bn b)

Year	Added in Year	% of Annual Production
1992	7.80	33
1993	4.00	17
1994	6.95	28
1995	5.62	23
1996	5.24	21
1997	5.92	22
1998	7.60	28
1992-98	43.13	25
Annual average	6.16	24

Source: WPT, 1999.

* Data for world excluding the USA and Canada.

What all this means is that the Middle East "swing" producers, with 65% of the world's proven oil reserves but with just over a third of global production, will assume a clear-cut leadership of the supply side of the oil market. In the major OPEC oil-producing countries, both exploration and investment in capacity expansion are down to minimum levels because the decision-makers in these countries have come to realize that the smaller the gap between output and capacity, the less the need to sell their oil at bargain basement prices.

What About Non-Conventional Oil?

The view is often expressed that technical progress will soon make up for the increasing natural scarcities, by developing acceptable substitutes and/or lowering the extraction and exploration costs of new reserves.[7] While some – and possibly a great deal – of the non-conventional oil such as heavy oil, tar sands oil and shale oil will eventually be available, it is unnecessarily reckless to believe, on the basis of evidence available at the present time, that it will be adequate from a quantitative point of view.

Oil supply from outside OPEC countries is expected to start declining from this year onward. Oil supply from Middle East producers is projected to peak by around 2013. Since the total conventional oil supply will not be able fully to match demand, additional supplies of liquid fuels are expected to become available from non-conventional sources. By 2008, global demand is projected to rise to 90 mbd, of which Middle East producers will account for 45 mbd, with non-OPEC producers providing another 35 mbd, whilst the balance of 10 mbd is supposed to come from non-conventional sources rising to 20 mbd in 2014 and 80 mbd by 2030.[8] This is not only an exceptionally daunting task, but virtually impossible.

Gas is at a relatively early stage of depletion. Gas production is likely to grow to a peak or high plateau around 2020 allowing it to form a valuable substitute for conventional oil. However, it is in the area of transportation that the potential loss of cheap oil will make its effect felt most. It is also doubtful as to whether natural gas is going to play a major part in the transportation sector especially when the growth in world population and the escalating demand for electricity is brought into the picture.

Conclusions

Rising global oil demand and the continuation of OPEC's discipline and adherence to cutbacks in production will ensure that the oil price remains relatively high in the short-term. And although growing Iraqi oil exports have partly offset the production cuts made by OPEC and other principal non-OPEC producers, they may not exert as strong a downward pressure on the oil price so as to cause a major drop.

In the long-term, rising global oil demand and a declining discovery rate of new reserves coupled with a projected decline in non-OPEC production could lead to a radical increase in the price of oil in the opening years of the new millennium with shortages expected to arrive sometime between 2001 and 2004. Only a major expansion in E&P expenditure by the oil industry over a prolonged period could slow down the upward trend of the oil prices. Yet, without sustained high oil prices, no major E&P expenditure would be forthcoming.

Footnotes

1 Jean-Pierre Favennec, "Can The Oil Price Remain Low?" Conference Proceedings of the 20th Annual North American Conference, August 29-September 1, 1999, Orlando, FL, USA, p.458.

2 Hart's E&P, December 1999, p. 143, also EIA's International Petroleum Statistics Report, Washington D.C., August, 1999, p.4.

3 Mamdouh G. Salameh, "Technology, Oil Reserve Depletion & the Myth of Reserves-to-Production (R/P) Ratio." Conference Proceedings of the 19th Annual North American Conference, October 18-21, Albuquerque, New Mexico, p.229.

4 Ibid., p.230.

5 EIA's International Petroleum Statistics Report, p. 17.

6 Petroconsultants' "World Petroleum Trends Report", 1999.

7 H. Houthakkar, "Oil & the Global Agenda", Nature, 4 August 1997.

8 Jean-Marie Boudaire, "World Energy Prospects to 2020." A paper presented to the British Institute of Energy Economics, London, 2 July 1998), pp.5-6.

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Market tools for sustainability
Balancing energy and environmental needs

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

NEW POLITICS AND ENERGY
Sub-national issues: how do they play in the end game?
New paradigms – markets, regions, corporate roles, NOC roles
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Developing Energy Networks in Southeastern Europe

*By Agis M. Papadopoulos**

The social and economic developments that have taken place, since the political changes of 1989/90, had their inevitable consequences for the world energy market. This applies particularly in eastern and southeastern Europe.

These changes were manifold, affecting the national energy markets as well as bilateral and international energy relations. After decades of subsidised, wasteful energy production and provision schemes, drastic reforms now occur: energy production is liberalised, energy pricing is more reasonable, the use of environmental burdening primary sources is put under question, energy consumption increases and rational use of energy becomes important.

Although the transition to the liberal energy economies had similar effects in most eastern European countries, the situation in southeastern Europe is slightly different. Political and socio-economic conditions have by far been less stable: The wars in former Yugoslavia (FYROM), the long-lasting economic crises in Bulgaria and Romania, the Greek-Turkish tensions and the conflicts of interests in the Black Sea and the Caspian region create an unfavourable background for energy networks and policies.

However, considering the geopolitical and social conditions, such networks and policies are necessary in order to establish sound energy provision schemes, and, therefore, the base for sustainable economic growth, expanding beyond the specific region. As far as transboundary energy flow is concerned one has to keep three points in mind:

- The flux of primary energy sources, like gas and oil, along the east–west axis from the Caspian region to Western Europe, presupposes political stability and a vast and costly infrastructure.
- The same applies to the flux of electricity along the west-east axis, in order to utilise capacities like the French nuclear ones.
- Finally, the perspective of 'closing the circuit' between southern Europe and the Northern African countries of the MAGREB, is not so remote as it seemed five years ago.

Energy networks and policies are also vital if one considers the national energy markets in the area. On the basis of data provided in the following paragraphs and after the examination of the energy features of these countries, one can easily deduce two conclusions:

- The installed capacities are about enough to cope with a 'reasonable' demand increase, but nothing more than this.
- With the exception of Greece and Turkey, the national markets are not big enough to justify major cost-intensive investments aiming at these markets only.

These observations were made in the early nineties by the European Commission and some major international projects, financed by the PHARE and SYNERGY programmes, were carried out which resulted in determining the key factors for a reasonable energy policy in south-eastern Europe. As such arose the necessity of:

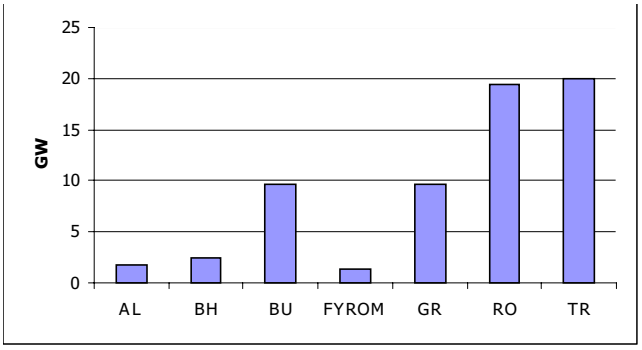
- An inventory of plans and proposals for the interconnection projects in the electricity, gas and oil sectors, and
- The evaluation and prioritisation of projects of common interest.

The most important points of these factors will be presented briefly in the following paragraphs.

The Electrical Sector

The electrical systems in the countries of southeastern Europe reflect, to a great extent, decades of political division, the troublesome political situation and the differences in technological development. Some of the problems to be overcome are the different operational standards and transmission modes, the state owned utility companies with important debts, the out-dated nuclear or coal-fired power plants and the networks destroyed by the wars in Bosnia-Herzegovina and Kossovo.

Figure 1
Installed Power Production Capacities



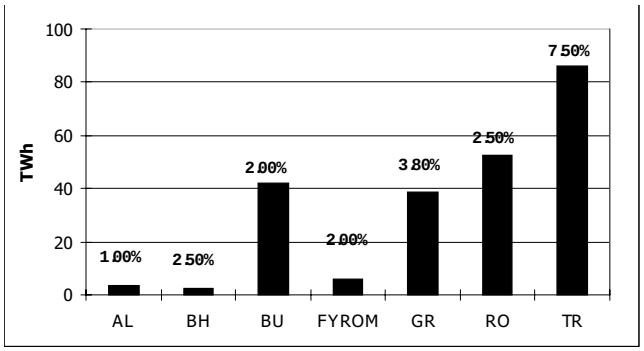
The current installed production capacities and the annual consumption per country, together with the predicted demand growth rates, are presented in Figures 1 and 2.

Comparing the data presented in these figures, one cannot fail to notice that the capacities of each country are by and large enough to cover the national demand. Seasonal and occasional surpluses or shortages are dealt with means of respective exports or imports to and from their neighbours. This situation is a clear result of the self-sufficiency attitude prevailing in the previous decades, which lead to a vertical structure of each country's electricity energy sector.

It has to be noted that the data presented go back to the year of 1996, as this is the most recent set of data available for all these countries. No reliable data on exports and imports were available for Bosnia – Herzegovina; Yugoslavia is not included due to the political situation. Bulgaria is shown as a net exporter, with its production depending on the Kozloduy nuclear plant, whilst Rumania is expected to become more self sufficient with the commissioning of the new Cernovoda nuclear plant. However, and in order to cope with future demand growth, the interconnection of these countries is crucial. In that sense and though considerable progress has been made since the mid-eighties, there is a significant potential for improvements. Romania, Bulgaria, FYROM and Greece are operating synchronised and according to the UCPTE (Union for Coordination of the Production and Transport of Energy) standards.

* Agis M. Papadopoulos is Assistant Professor, Laboratory of Heat Transfer & Environmental Engineering, Department of Mechanical Engineering, Aristotle University of Thessaloniki GR-54006 Thessaloniki, Greece. He can be reached at e-mail: agis@vergina.eng.auth.gr

Figure 2
Annual Power Production and Demand Growth Rates



The 400 kV connection via Hungary and Yugoslavia is not operational, as a result of the Kossovo war, but the connection over Romania should soon provide a solution for this problem. An alternative route will be provided by the underwater 400 kV connection between Italy and Greece, which is to be completed by 2001. It is needless to say that the interconnection of Yugoslavia will provide significant margins of stability and capacity to the system.

On the eastern side of the area, Turkey is only connected with a single 400 kV line to Bulgaria, with very limited capacities. The planned 400 kV 2B'B' connection between Greece and Turkey would provide an important boost to the grid of the area. This project, which is technically and financially very sound, is subject to the difficult relations of the two countries.

The SYNERGY task force concluded in the following high priority joint projects, which were approved last October by the energy ministers of all the involved countries:

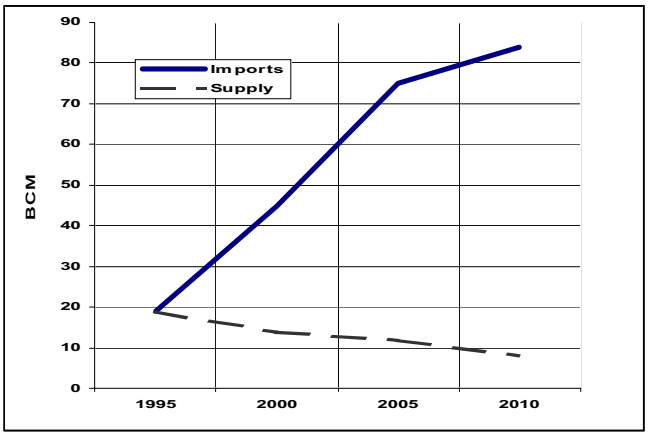
Code	Action
E 16	400 kV line Arad (RO) – Sandorfalva (HU)
E 7	Development of the control system of the transboundary network
E 6	Improvements on the following 400 kV lines of the networks: • Blagoevgrad (BU) – Thessaloniki (GR) • Sofia (BU) – Nis (YU) • Kozloduy (BU) – Tintareni (RO) • Maritsa (BU) – Babaeski (TR) • Dobrudja (BU) – Vulkanesti (MLD)
E 14	Rebuilt of the 400 kV system in B-H
E 13	Upgrading to 400 kV of the line Bitola (FYROM) – Amyndeon (GR)
E 9	400 kV line Philippoi (GR) – Plovdiv or Maritsa (BU)
E 9	400 kV line Thessaloniki (GR) – Hamidabat (TR)

The prospects for most of these projects are positive and the good possibility of some of them being completed by the year 2001 will enable an increase in electricity consumption respective to the expected economic growth in most of these countries. Most of these projects will be supported, directly or indirectly, by European funding sources. Besides the obvious geographic conditions, Greek constructors and banks are participating in the bidding, or already established, project consortia.

The Natural Gas Sector

The propagation of natural gas in the region has been rather modest. Romania is the only gas producer, and, therefore, the only country that features an infrastructure; however, this is ailing and production is diminishing. Bulgaria has a certain infrastructure, importing gas mainly from Romania, but recently also from Russia. FYROM is connected to Bulgaria, over an obsolete pipeline and Albania is currently not connected at all. Romania, Greece and Turkey are expected to become the major gas consumers of the region over the next years.

Figure 3
Predicted Gas Consumption and Production Values of the Region



The consumption of every single country is not considered to be significant, by international standards. Still, the total energy consumption of the region, plotted in Figure 3 vs. the regional production (i.e., that of Romania), makes it still worth examining the options of establishing and upgrading regional networks to provide for the smaller countries.

The Oil Sector

The analysis of the prospects for oil transport networks in the area has to be carried out under two criteria; namely that of the regional market and that of the region as a corridor for oil transports.

Oil has become a significant factor, in terms of political decisions, for the southeastern European region. The prospects of exploiting the Caspian oil fields, leads to some debates on the issue of the transport. The alternative routes examined can be synopsised as follows:

- Over Azerbaijan to Turkey (Ceyhan) in the Mediterranean.
- Over Azerbaijan and Georgia to Turkey in the Mediterranean.
- Over Azerbaijan and Georgia by ship on the Black Sea through the Bosporus and the Aegean.
- Over Azerbaijan and Georgia by ship on the Black Sea to Bulgaria (Burgas) by pipeline to Greece (Alexandroupolis) and the Aegean.

The evaluation of these alternative, but not mutually exclusive, scenaria is a complex issue, taking into consideration technical, financial, environmental and political factors, the presentation of which exceeds the scope of this presentation. Still, it is beyond any doubt that any single

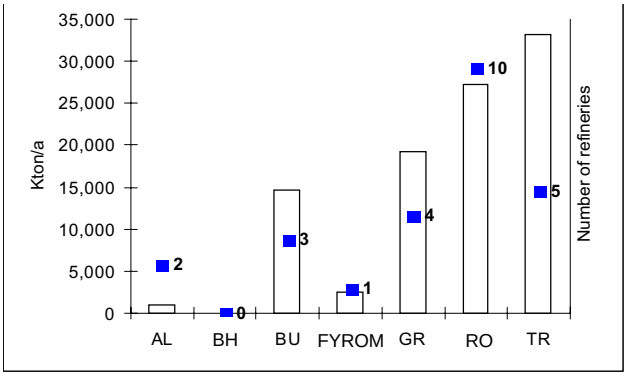
(continued on page 20)

Southeastern Europe *(continued from page 19)*

choice will also have side effects on the energy economics of electricity and gas.

As far as oil consumption in the region is concerned, it is expected to increase by an average of 2.4% p.a., with energy efficiency measures maintaining consumption at a pace with economic growth. As the countries of the region are heavily dependent on oil imports, the main problem to be tackled is the one of refining capacities. As it can be seen from the data presented in Figure 4, there are 25 refineries in the region, with an annual refining capacity of 98,000 ktons, or 1.7% of the world's total value.

Figure 4
Refining Capacities in the Balkan Area



These capacities are not capable of coping with increasing demand and in principle there are two options available:

- The existing refineries can be upgraded, in order to refine bigger quantities of crude oil from the CIS area.
- Refined products from Western Europe should be imported.

Both options are costly, the former coming in question only for Greece and Turkey, the latter being a short-term solution for Albania and Bosnia-Herzegovina.

In that sense, the agreement of Greece and FYROM to build the oil pipeline between Thessaloniki and Skopje and the decision of Hellenic Petroleum S.A. to modernise and expand the refinery in Thessaloniki, seem to be reasonable steps for the coming decade. Provided the political situation in Kossovo becomes stable, the extension of the pipeline to Albania would be a step further in that direction.

Conclusions

Despite the complex political situation and the economic restrictions in southeastern Europe, the necessity for an effective co-operation in the energy field has been recognised by the authorities of most countries. An international task force, financed by the European Commission and co-ordinated by Professor D.Mavrakis (University of Athens) has determined the priorities, as they were briefly described in the previous paragraphs.

The same task force is currently examining the options for funding the implementation of the much needed, but also cost-intensive, projects. The European Investments Bank, the European Bank for Restructuring and Development and the major European players in the energy production sector are possible options.

These results have been acknowledged in a formal way as part of the BSREC (Organisation of the Black Sea Region for Economic Co-operation) memorandum, signed by the energy ministers of Albania, Armenia, Azerbaijan, Bosnia-Herzegovina, Bulgaria, FYROM, Georgia, Greece, Moldavia, Romania, Russia, Turkey and Ukraine.

Furthermore, the results concerning the electrical networks and trade have taken the official form of a memorandum for the establishment of a regional electricity market, signed by the energy ministers of the BRESC in Thessaloniki, in September 1999.

These developments can allow a certain degree of optimism for the future of southeastern Europe, which has been clouded by some problems during recent years.

Transformations in the German Electricity Sector

*By Georg Erdmann**

Is seems that the long period of ideological debate on electricity supply issues in Germany is over. Today is the moment of action. Never before has the industry seen so many important interventions in such a short time, and never before has the industry seen more restructuring, business initiatives, and price dynamics than during the past year. Usually, any business change creates winners and losers, chances and risks, but today there is an unusual amount of uncertainty and confusion about the future of the industry. This article aims to give an interpretation of the recent evolutions and some estimates of future developments.

All began with the European Directive of 19 December 1996 on the European internal electricity market that determined minimum competition standards for electricity trade. In complying with this directive, the German Parliament adopted an Energy Law in April 1998 that opened 100 percent of the electricity market from one day to the other, at least formally, by choosing negotiated third party access as the grid access scheme. But the associated negotiations are complicated and take a lot of time during which the electricity market, in practice, is still not 100 percent open.

No particular electricity market authority has been established so far in Germany. The competition is assured by the federal antitrust authority (*Bundeskartellamt*), while the appropriate grid access framework is left to market forces (*Verbändevereinbarung*). According to some experts a particular electricity market authority might have achieved faster results than negotiations among business associations and between individual companies, but the establishment of such an authority would have required time as well. More important, such an authority would have started without sound knowledge about what might be the optimal grid access scheme. According to the experience in other countries, several modifications of such a scheme should be expected before a workable competition is established. Thus, a national grid authority cannot offer more stable market rules than agreements between private business associations.

An obvious advantage of the German approach is that a national grid authority can still be established if necessary, while the abolishment or a major modification of such an

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* Georg Erdmann is a full professor at the Technical University Berlin and President of the German Affiliate of the IAEE.

institution would probably be impossible. Because the market players want to avoid the national electricity authority, the German federal government has some indirect influence on the outcome of private sector negotiations. In total, the German strategy of electricity market self-organization is quite successful so it will probably not be replaced in the near future.

The successful introduction of electricity market competition is reflected in electricity prices that recently went down on a broad scale. The Association of German Power Companies (VDEW) estimates that the overall electricity bill was • 7.5 bn or about 20 percent lower in 1999 than in 1998. Few experts expected such a degree of price collapse and many companies in the electricity sector suffer from enormous stranded costs, in spite of significant cost cutting programs. Until recently German law strictly refused to offer any fiscal compensation for stranded costs and thus increased the pressure on the exposed market players. The reaction was the closure of generation capacities, particularly small and medium sized coal and gas fired cogeneration plants.

But as cogeneration is regarded to be an important greenhouse gas option for Germany, new political initiatives try to correct for this unintended result of electricity market deregulation. The discussion is still going on, but a combination of subsidies (in the form of fixed feed-in tariffs) and a mandatory cogeneration quota will soon be introduced. Both measures will be financed through higher electricity transmission and/or distribution prices.

There are more reasons why electricity customers will probably not see lower prices in the future. First, many companies sell parts of their electricity below their short term marginal costs which cannot be a sustainable market situation. The power generation over-capacities should still execute a strong pressure on electricity prices, but the generation companies have begun to learn how to stabilize (spot) market prices. Second, the federal electricity tax rates introduced in April 1999 will increase in coming years; in 2003 they will be 0.004 • /kWh for industrial customers and 0.02 • /kWh for all others. Third, the recently modified Law on Renewable Energies (*Erneuerbare Energien Gesetz*) increases the fixed feed-in tariffs for electricity produced from renewable energy sources and generates indirect subsidies of up to 2 bn • per year. Again the transmission and/or distribution of electricity will be charged.

In such a market environment any aggressive electricity price policy is a costly venture for the majority of power companies. The generation of shareholder value through discount prices requires the establishment of stable customer relations and the supply of additional services being sold for good money. Apart from market niches the success of appropriate efforts is still not convincing. It may be that information technologies will be available that open the electricity grid for telecommunications. In this case the shareholder value potential for power companies will improve. But the necessary investments into the new technologies and shortages in human capital will give majors an advantage over small and medium sized (municipal) electricity suppliers.

Many of today's over 700 electricity suppliers in Germany – mostly local and regional distribution companies with some smaller generation capacities – will probably not survive as independent market players. Mergers and acquisitions are on top of the agenda today. The announced merger of *PreussenElectra* with *Bayernwerke* and *RWE* with *VEW* is only the first step in this transformation of the market. The next step could be the expansion of these in generation and transmission specialized companies into the distribution business.

Much depends on the national and European anticartel authorities and their interpretation of the relevant market. According to recent announcements by these bodies a German duopol will not be accepted. Accordingly, the east German VEAG should survive as another independent electricity company, in spite of its particular stranded cost problem due to extensive post unification investments.

The recent electricity market restructuring occupies virtually all the existing management capacities of the electricity sector – and even more. After a period of relatively conservative career opportunities the industry offers challenging perspectives and is able to attract many skilled and creative people. The role of engineers is diminishing in favor of business administrators, marketing experts, traders and lawyers. These people regard the company's image as a more important success factor than a particular portfolio of power plants. Many of them also have an advanced view about protecting the environment.

All this should affect the medium to long-term behavior of the industry. Present political issues such as the role of nuclear power, the extension of renewable electricity generation or the approach to least cost planning will nearly automatically lose their social conflict potential. If the government applies an appropriate approach, the still unresolved environmental issue of reducing greenhouse gas emissions may be addressed in firm cooperation with the modernized management. This approach should take into consideration that the existing over-capacities in the electricity sector (at least 10.000 MW in Germany) leave no space for major emission improvements during the next ten years or so. But the expected capacity investments from the year 2010 onwards will change this; they offer strong long-term opportunities for a successful greenhouse gas policy in cooperation with the electricity sector. After having solved the most urgent questions posed by the electricity market liberalization it is time to start thinking about these long-term opportunities and to develop strategies for using them.

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Vertical Integration and the International Oil Industry: A Conceptual Error and Some Thoughts on its Implication

*By Paul Stevens**

The vertical integration of the international oil compa nies has long been a subject of interest to economists. More recently, interest in the issue has been revived as the result of two developments – oil company mergers and national oil company restructuring. However, much of the emerging discussion is based upon a fundamental conceptual error regarding the nature of vertical integration. This short paper seeks to explain the error and consider its implications.

The first development reviving interest in vertical integartion has been the spate of mega-mergers starting with BP-Mobil's downstream venture in Europe in 1996 and culminating with a rash of very large scale mergers during 1998-99. A major driver of these mergers has been the relatively poor performance of parts of the value chain most notably refining. Refineries in general (there are niche exceptions) seem congenitally incapable of earning an acceptable return on a regular basis. Over-capacity and the underlying economics of refining with its high fixed costs force greater throughput and hence cut-throat competition to move the greater volume of products. As the mergers have been approved by the relevant authorities, so the new entities are addressing their portfolio of assets and beginning a process of divestment of lesser performing assets to try desperately to increase overall financial performance in a mature (declining?) industry. This process is giving rise to questions from both inside and outside the companies as to the shape of oil companies and their vertically integrated nature. Many are even questioning whether owning refineries an integral part of the value chain.

The second development which has revived interest in vertical integration is the recent tendency to evaluate and restructure national oil companies. Beginning in the 1980s a number of national oil companies, led by Venezuela and Kuwait, began to acquire downstream assets from the majors who were trying to rationalize their asset portfolio by divesting poor performing assets; a process in many ways similar to the current developments described above. This acquisition has been on a relatively significant scale. For example, Venezuela is now the largest gasoline retailer in the United States. The official reasons for this move to vertical integration included locking-in market share and generating investment income. However, an equally plausible explanation was to deepen the information asymmetries at the heart of the principal-agent relationship thereby enabling greater rent capture by the national oil company. Operating abroad makes it much easier to disguise what is going on from the relevant ministry. It is the growing realization by host governments of this threat which has prompted an increasing number to scrutinize the behaviour of their national oil companies, in particular in relation to this vertically integrated structure.

In this context of renewed interest in vertical integration in the oil industry a serious analytical error is creeping into both the academic literature and the trade press. It is a classic example of the sort of error to which economists are prone when they seek to apply the contents of their intellectual tool bags with a complete disregard of the facts of the case to which they apply the concepts. Unfortunately, study of the oil industry has been especially prone to this sort of error, the most spectacular example being the huge literature spawned by the ideas of Harold Hotelling.

The economics literature fails to make this explicit but vertical integration can take two forms. These forms I have labelled financial and operational vertical integration. Financial vertical integration is when different stages in the same value chain are owned by one holding company. The crude producing affiliate, the refinery and the marketing network are all owned by the same company which effectively controls the cash flows of the affiliates. Operational vertical integration by contrast is when the owned crude or products move between these affiliates on the basis of some sort of internal transfer. Operational vertical integration obviously requires the presence of financial vertical integration. However, the reverse is not true. It is perfectly plausible for markets to replace operational vertical integration. Hence the affiliates sell their crude into the world oil markets. The refineries secure their slate from those same markets and sell their products into global product markets where the marketing and distribution affiliates secure their inputs. The affiliates in effect all operate on an arms length basis. The literature ignores this distinction and talks about "vertical integration" when is it actually referring to companies which are financially AND operationally vertically integrated.

Which is better for a financially vertically integrated company - operational vertical integration or markets - depends upon a number of different factors.

The major private oil companies, before the second oil shock of 1979-81, were financially and operationally vertically integrated. Several factors explain. Crude markets were characterized by a small number of transactions and poor transparency. Most crude flowed on an inter-affiliate basis hence there were few arms length players and few arms length transactions. Furthermore, the details of the relatively few transactions which took place were closely guarded commercial secrets. The markets lacked transparency. The result was inefficient markets which meant their use involved very high transactions costs compared to inter-affiliate transfers. Security of throughput was crucial to profitability given very high fixed costs at all stages in the industry. The best way to achieve such security in the face of inefficient markets and the weakness of long term contracts in an uncertain world was operational vertical integration. This created a self feeding circle. Inefficient markets led to higher transactions costs which encouraged ever greater operational vertical integration. This reduced the number of players and market transparency thereby reducing efficiency and increasing transactions costs.

However, this was only part of the story. Operational vertical integration also generated a number of other benefits for the companies. Of key importance was that it inhibited competition. In theory at least, if enough oil companies were operationally vertically integrated, this created significant barriers to entry. If the companies only exchanged crude between their affiliates, there was no access to crude for third

* Paul Stevens is professor with the Centre for Energy, Petroleum and Mineral Law and Policy, University of Dundee, Dundee, Scotland. He can reached at p.j.stevens@dundee.ac.uk

parties. Entrants had to enter at all stages in the value chain or not at all. Also, it was possible to practise price discrimination by integrating into the low priced market preventing arbitrage. Operational vertical integration also enabled the companies to play lots of tax games through the use of transfer prices to minimize their global tax bill. In the 1950s and 1960s many West European refineries posted financial losses yet the companies were building them as fast as possible.

After the second oil shock of 1979-81, the world changed and the private companies moved away from operational vertical integration preferring instead to use markets. This increasing reflected several factors. The nationalizations of the 1970s plus the discrediting of long term contracts during the panic of the second oil shock increased the number of arms length transactions which meant a greater number of buyers and sellers and greater market transparency. This only occurred after the second oil shock because despite the nationalizations of the first half of the 1970's (which de jure dispossessed the companies of much of their crude producing affiliates), producer governments left the oil companies responsible for crude disposal.

The consequent lowering of transactions costs encouraged the further use of markets which created a self feeding process of more players and transparency. Greater transparency was also strongly reinforced by the development of forward and futures markets coupled with the information technology revolution. Amazingly but technically correct, it was not until futures trading began that we had a real statistical oil price record of actual transactions rather than the (albeit informed) guesses of analysts and price reporting agencies. Even in the days of government official selling prices, an ability to manipulate terms disguised true transactions prices.

Other factors reinforced the private companies' moves away from the use of operational vertical integration. Barriers to entry weakened as new un-integrated crude producers entered the market in the 1980s and as the majors began to sell off refineries to smaller petropreneurs. In such a world, constraint of competition became less relevant because of its unattainability and the greater number of players reinforced the growing efficiency of the markets. Finally, the tax authorities began to constrain oil companies' ability to play transfer pricing games.

The overall result was that operational vertical integration among the private companies, except in certain specific cases disappeared. For example, a refinery affiliate at the end of a pipeline affiliate was still likely to lift its crude on an inter-affiliate basis. However, the national oil companies which had developed a financial vertically integrated capability used operational vertical integration rather than markets. Several explanations are relevant. If locking-in volume was the prime motive then this required the refinery affiliate to lift from the crude producing affiliate. In addition, many in the national oil companies simply did not understand the distinction between financial and operational vertical integration. They simply assumed that private oil companies continued to use operational vertical integration because "this is what oil companies do, isn't it". Finally, inter-affiliate transaction paperwork is arguably easier to fog that an arms length contract thereby helping to maintain the information asymmetries.

With this background in mind, does the neglect of this distinction between financial and operational vertical integration matter? It does so for several reasons.

Potentially, it invalidates the study of vertical integration in the oil industry on either a time series or a cross section basis. In a time series study, comparing levels of "vertical integration" today with say the 1970s is quite misleading. The companies which were "vertically integrated" in the 1970s, today, while appearing to be the same, in reality are only financially vertically integrated. The comparison is meaningless. Similarly, a cross section study is in danger of assuming that companies which are operationally vertically integrated are comparable with those which appear to be "vertically integrated" but in fact use markets and not inter-affiliate transactions. Again any such comparison is quite meaningless.

The distinction is also important because it disguises a key issue for the future. Will companies which are financially vertically integrated use inter-affiliate transfers or markets? An issue which will have significant implications for the future efficiency of oil markets. For example, if national oil companies continue to increase their downstream capabilities and prefer operational vertical integration, will this reduce the number of players and transactions? If so and if market efficiency begins to suffer, might this persuade financially vertical integrated companies now using markets to revert to inter-affiliate transfers? A process which would further inhibit market efficiency. A similar process might be reinforced if there is any tendency to revert to the use of long term sales contracts. Would this reduced market efficiency in turn have implications for concentration and competition at different stages of the industry? Alternatively, would the development of paper barrel markets counter any reduced efficiency from fewer wet barrel transactions?

The distinction also helps illuminate questions over the future of financial vertical integration. Since companies initially developed financial vertical integration primarily to allow operational vertical integration, will a growing use of markets invalidate its continuation? What will encourage greater or lesser use of financial vertical integration? Are we moving to a world where large international oil companies need not own refineries any more than they do not own drilling rigs or seismic teams?

All these issues and more arise once the distinction is made between financial and operational vertical integration. The distinction is more than mere academic pedantry.

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New Orleans, LA – January 5-7, 2001

The IAEE annually puts together a session at the ASSA meetings in early January. This 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 1, 2000. Final decisions will be made by May 29, 2000.

For complete ASSA meeting highlights please visit http://www.vanderbilt.edu/AEA/index.ht

Price Of Power In California Is Up. Wasn't It Supposed To Go Down?

*By Fereidoon P. Sioshansi**

With the introduction of competition in the California market in 1998, the expectation was that the price of electricity would go down. That is what economic theory predicted and what many experts were promising the regulators and the consumers. Now that a couple of years have gone by and some empirical evidence is becoming available, it turns out that the opposite has, in fact, happened.

Both Pacific Gas & Electric Company (PG&E) and Southern California Edison (SCE) report that the price of "competitive" energy that they purchased in 1999 from the California Power Exchange (Cal PX) for their customers was up compared with 1998. In the case of PG&E, energy costs for customers who have not switched suppliers rose $207 million in 1999 compared to 1998—not an astonishing amount but significant nevertheless. In the Southern half of the state—which continues to be dominated by SCE—the average PX price in 1998 was 2.54¢/kWh in 1998 compared to 2.68¢ in 1999. How could that be? Wasn't competition supposed to *reduce* prices?

As is always the case, there are a number of factors contributing to this seemingly paradoxical result. Insiders attribute this to several things including higher demand in 1999 due to a strong economy that is growing at 2 - 2.5% per annum. This has led to gradually tightening reserve margins, exacerbated by transmission bottlenecks. But there are a number of other factors which undoubtedly contributed to higher prices—and will continue to influence them in 2000:

- First, California's independent system operator (ISO) may be *contributing* to the problem by keeping *too much* capacity in reserve.

As a non-profit organization, the ISO does not make—or lose—any money based on how *tightly* it manages the system, particularly during high demand episodes. Hence, all else being equal, the Cal ISO has a disproportionate incentive to play it safe—perhaps too safe.

The explanation is simple. So long as the lights stay on, the ISO gets little or no criticism—and certainly no newspaper headlines—even if the prices are a tad higher than they should be. But should it run the system too tightly and the lights ever go out, it'll get a huge outcry of negative publicity. It should, therefore, come as no surprise that the ISO would prefer to keep—and pay for— a comfortable safety margin at all times. In normal times, this extra reserve does not cost much. During high demand periods, it costs a bundle.

- Second, the new plant owners in California are under pressure to recoup their investments in the plants they bought at premium prices.

The generating plants divested in California—as those elsewhere in the United States—were sold at substantial premiums above book value. The new owners are now under pressure to recoup those inflated investments. They have every incentive to make as much money as they can.

In a perfectly competitive market, there will be limits to their ability to price gouge. However, the California market—like all other markets—is not a textbook example. These imperfections—particularly in the ancillary services market—allow the players to exercise market power. This should not come as a surprise either.

- Third, maintaining the PX and ISO adds to the costs—approximately $1/MWh (roughly 30¢/MWh for the PX; 70¢ for the ISO). Having two organizations instead of one, makes it worse.

More fundamentally, the California market—like those in the UK and Australia—is, in reality, only a half market.

Currently, there is a near complete disconnect between generation and demand. Customers, by and large, do not see the hourly price fluctuations in the PX and have little or no opportunity or incentive to respond. In the absence of *demand-side bidding*—the ability of customers to respond in real-time to price fluctuations—no market, no matter how well designed on the generation side, will function well. In the UK, new electricity trading arrangements (NETA) will attempt to address this issue starting in October. Others need to follow suit.

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* Fereidoon P. Sioshansi is the President of Menlo Energy Economics in Menlo Park, CA. He is also the editor and publisher of EEnergy Informer, a monthly newsletter. This is an edited version of an article which appeared in the April 2000 issue. For further information, contact EEInformer@aol.com.

Workshop on Fuel Cell Policies

Georg Erdmann, Technical University Berlin

Bernd Höhlein, Forschungszentrum Jülich GmbH

Fuel-cell systems may be among the new key technologies of the 21st century. Their short-term contribution to solving environmental and other societal problems may be small or negligible, but in the medium and long term they could become a "door opener" in the post-fossil-energy future. In this case the technological fuel cell experience is one of the success factors of highly developed industrial societies and particularly for those companies that create shareholder value through the conversion, distribution and use of energy.

Accordingly, considerable public and private research and development efforts are being undertaken and have achieved some remarkable progress in the past and led to the expectation that the first marketable products would soon be available. However, there are some unresolved questions as to whether these business efforts can smoothly be translated into large business and markets. As experience shows, even rather favorable technologies fail on the market if there are no coordinated activities between different interested groups. In addition political commitments should moderate the fuel-cell market entry process.

Based on these guidelines and taking the most recent research and development efforts concerning mobile and stationary application of fuel cell systems into consideration, the

Workshop on "Fuel Cell Policies" in Berlin, 28 - 29 June 2000

Addresses the following topics:

- What may be the contribution of fuel cells towards solving societal problems?
- What are the medium- to long-term potential benefits from fuel-cell systems?
- What are the fuel-cell market entry requirements and prospects for market players and society?
- Why may inter-business commitments be necessary for achieving fuel cell market success?
- What should the government contribution to this process be?

The two day workshop will be structured in four sessions covering mobile fuel cell applications, stationary applications, infrastructure requirements and political considerations. Invited speakers from the automobile industry, energy business, consulting, research institutions and politics will present their distinguished views and will leave much space for discussion.

The German Affiliate of the IAEE organizes the workshop in cooperation with the IEA Paris, the Technological Assessment Office of the German Federal Parliament and the local power company BEWAG AG. The latter will present its brand new 250 kW Ballard fuel-cell to the workshop participants.

For more information please contact the internet *www.gee.de* or send an email to one of the conference presidents *georg.erdmann@tu-berlin.de* or *b.hoehlein@fz-juelich.de*.

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

result, there will always be too many refineries.

Mamdouh Salameh asks the question, "Can the Oil Price Remain High?" and then proceeds to look at the factors that will determine the answer: the global demand for oil, OPEC's discipline, Iraq's oil exports, the reserve depletion rate and new oil discovery rates. He concludes that rising oil demand and a declining discovery rate together with a decline in non-OPEC production could lead to a substantial increase in the price of oil in the early years of the new millennium with shortages likely between 2001 and 2004.

Agis Papadopoulos looks at the energy situation in southeastern Europe and notes that despite the complex political situation in the area, the necessity for effective cooperation in energy is recognized. He examines the situation in electricity, gas and oil and comments on the prospects for each.

Georg Erdmann reports on the transformation of the German electrical market noting the unusual amount of uncertainty and confusion that exists. He notes that, unlike most other countries, Germany did not establish a market authority to implement the European Directive on deregulation but rather has let the players self-organize the market. That this has been successful is indicted by the reduction in electricity prices that has occurred.

Paul Stevens examines vertical integration of international oil companies, noting that this can take two forms: financial and operational vertical integration. While the latter obviously requires the former, the reverse is not true. Markets can replace operational integration. He examines the implications of this.

Perry Sioshansi reports that the price of electric power in California is up, when it was supposed to go down, given deregulation. What happened? He suggests some reasons why but notes that in the absence of demand-side bidding no market will function well.

Edgardo Curcio reports on the privatization of ENI and we have a number of Affiliate notes as well as a summary of the energy situation in Taiwan. Once again we indebted to Mike Lynch for his help in assembling this issue. We're much obliged, Mike.

We're looking forward to seeing many of you in Sydney.

DLW

Privatisation of ENI SpA

ENI is an Italian integrated energy company, operating in the oil, natural gas and petrochemical industries as well as oilfield services and engineering. It has a strong competitive edge and leading market positions in these business. ENI's objective is to create value for its shareholders through constant improvements of cost and quality of the products and services offered to its consumers.

The ENI privatisation started in 1992 when the Italian government decided to open the path to a radical change for this industrial group that had been a fundamental tool in the energy policy of the country after the 2nd World War. The changes in the international energy market, the overcoming of the difficulties in supplying energy sources to Italy, the liberalisation and globalisation of the economic systems led to the opportunity to create a different structure of ENI's share stock, opening it to private shareholders.

From 1995, the Italian Ministry of Treasury following the restructuring and re-focussing of ENI's core business on hydrocarbons, has put on the stock exchange, in four *tranches*, 65% of ENI's share capital (with a limit of 3% for any shareholder) for national and international institutional operators, individual subjects and the group's employees.

ENI's quotation on the main world financial markets was rightly considered as one of the most important operations of privatisation at the international level that increased the Company's credibility among the leaders of the oil business. It also contributed to strengthening Italy's position while the country was making a great effort – successfully carried out – to reach the Maastricht standards. The positive effects of this choice which rendered the whole Group stronger and more efficient are shown by the great results achieved during these last few years, reaching in 1999 a record net profit of 5,500 billion It. Lire.

ENI has now become the company with the highest capitalisation rate in Italy and the largest number of shareholders. At present ENI:

- Operates in more than 70 countries where it employs more than 80,000 people,
- Holds estimated proved reserves (at 31 December 1999) of 5,534 million boe,
- Produces more than one million barrels of oils equivalent a day, with a reserve replacement ratio of 206%,
- Boasts a return of capital employment (ROACE) of 12.2%,
- Is listed on the New York and Milan stock exchanges,
- Has capitalisation amounting to 100,000 billion lire (as of June 1998).

Among publicly traded oil companies, ENI ranks:

- 7th in the world in reserves,
- 8th in the world in production,
- 2nd in Europe in domestic gas sales,
- 4th in Europe in total refining capacity,
- A leader in the European petrochemicals industry.

ENI is now trying to launch all its activities. The strong competition in the field of energy is going to intensify in the future. The progressive opening of the gas markets in Europe and the tendency toward liberalisation of the Italian energy market have required a particular effort toward progress and renewal in order to maintain and increase the results obtained by ENI up to now.

The challenge is to achieve strong positions abroad enabling ENI to sustain the growth and create new values by grasping the best opportunities offered by the international market.

A progressive transfer of the investments abroad has paved the way to multinationalisation.

This has become the main strategic purpose of ENI's activities.

Such perspective requires a new style of management in the field of oil and natural gas based on the necessity of putting together, in a creative manner, ENI's strength, solidity and integration capacity with its operating efficiency and openness to external stimulating factors.

The following is a synthetic presentation of the most recent events of ENI's strategic actions in 1999:

- Mineral assets were acquired for US$ 1,038 million in the Exploration and Production segment, including recoverable reserves totalling 317 million boe;
- In Libya ENI and the Libyan National Oil Corporation agreed to jointly develop the Wafa oil and gas field, located in the Libyan desert, as well as C in the NC-41 permit, in the Mediterranean offshore, with total recoverable reserves amounting to 1.8 billion boe. This project includes: the construction of onshore and offshore infrastructure, the laying of pipelines that will carry natural gas and condensates to the Mellitah processing plant on the Libyan coast and the laying of a 32", 540-kilometer underwater gasline linking Mellitah to Sicily. The processing plant will have a full capacity of 10 billion cubic meters of natural gas per year, 2 billion of which will be sold to the domestic market and the rest exported to Italy.
- ENI acquired 33.34% stake in GALP, Petróleos e Gás de Portugal, the Portuguese national oil company, for 964 million euro in January 2000. This acquisition will allow ENI to develop its presence in the expanding markets of the Iberian Peninsula and Latin America, pursue geographic diversification in natural gas and reinforce its presence in potentially developing areas in downstream oil.
- ENI acquired the concession for natural gas distribution in the North Western area of the Brazilian state of Sao Paulo for 137 million euro.
- Through Blue Stream Pipeline Company BV, the Joint venture established on an equal basis between ENI and Gazprom, Saipem, Bouygues Offshore and a consortium of Japanese companies signed an agreement for the construction of the offshore section of the Blue Stream gas pipeline. The gasline will have a yearly transport capacity of 16 billion cubic meters of natural gas coming from Russia and marketed jointly by ENI and Gazprom in Turkey. This project is part of ENI's strategy of geographic diversification in natural activities by entering fast growth markets such as Turkey.

Edgardo Curcio
President, AIEE

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The Energy Situation in Taiwan

Economic Development

The rapid economic development of the Republic of China on Taiwan over the past 20 years has created substantial changes in the production ratios of the nation's economic sectors from 1979 to 1999:

- The agricultural production value dropped from 9% to 3% of GDP,
- The industrial production value dropped from 45% to 33%,
- The production value of services rose from 46% to 64%,
- Real GDP rose from US$62 billion to US$282 billion,
- Per capita GNP increased from US$1,920 to US$13,203,and
- Foreign trade jumped from US$30.9 billion to US$232.3 billion.

Energy Supply

The total amount of Taiwan's energy supply increased from 29.84 million kiloliters of oil equivalent in 1979 to 98.88 million kiloliters in 1999 for an annual average growth rate of 6.2%. Since Taiwan is not endowed with rich land-based energy resources, the ratio of indigenous energy to total energy supply decreased from 17% in 1979 to 3% in 1999 while that of imported energy increased from 83% in 1979 to 97% in 1999.

The structure of energy supply in Taiwan has changed as follows:

- Coal's share increased from 13% in 1970 to 30% in 1999,
- Oil decreased from 72% to 51%,
- Natural gas increased from 6% to 7%,
- Hydropower dropped from 4% to2%,
- Nuclear flower increased from 5% to 10%,
- Coal was the main energy source before 1966 in Taiwan, but oil replaced it as the major energy source from 1967,
- Since the second oil crisis, the government of the ROC on Taiwan has advocated the substitution of coal and nuclear energy for oil,
- Expenditures for imported energy amounted to US$7.33 billion in 1999, of which imported oil accounted for US $4.34 billion, or 59.2%, and
- Imported energy accounted for 6.6% of total import value in 1999 and 2.5% of GDP, with an average per capital spending of NT$10,788 for energy imports.

Energy Consumption

Energy consumption in Taiwan increased from 26.82 million kiloliters of oil equivalent in 1979 to 84.81 million kiloliters in 1999. The annual average growth rate during this period was 5.9% while that for the GDP was 7.3%; energy demand elasticity was 0.82.

Per capita energy consumption increased from 1,549 liters of oil equivalent in 1979 to 3,864 liters of oil equivalent in 1999 for an annual average growth rate of 4.7%. The energy consumption structure in Taiwan from 1979 to 1999 breaks down as follows:

1. By consuming sector:
   - Industry dropped from 65% of the total in 1979 to 55% in 1999,
   - Transportation increased from 11% to 17%,
   - Agriculture decreased from 4% to 1%,
   - Residential increased from 10% to 12%,
   - Commerce increased from 2% to 6%,
   - Others remained around 6%, and
   - Non-energy use increased from around 2% to 3%.
2. By energy source:
   - Coal increased from 8% in 1979 to 11% in 1999,
   - Petroleum products decreased from 51% to 40%,
   - Natural gas dropped from 7% to 3%, and
   - Electricity increased from 34% to 46%.

Energy Policy

The first version of The Energy Policy of the Taiwan Area was approved by the Executive Yuan and promulgated in April, 1973. Afterwards, in response to the impact of energy crises and changes in the energy situation, energy policy was revised three times: in 1979, 1984, and 1990. However, the prevailing energy policy needed further review and revision in response to recent dramatic changes in the local and international energy situations and operating environment. Energy policy was thus revised the fourth time on July 25, 1996.

The aim of this policy is to establish a free, orderly, efficient, and clean energy demand and supply system based on the current environment, local characteristics, future prospects, public acceptability, and practicability.

To achieve this aim, the nation's energy policy includes six specific guidelines, 17 policy provisions, and 54 implementation measures carried out by eighteen government organizations.

A National Energy Conference was convened in Taipei on May 26th and 27th, 1998, for the purposes of formulating strategies and measures in response to the impact of the United Nations Framework Convention on Climate Change and seeking a balance among economic development, energy supply, and environmental protection in Taiwan.

Stephen S. T. Lee
Taipower

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DISTRIBUTED RESOURCES:

TOWARD A NEW PARADIGM OF THE ELECTRICITY BUSINESS

Edited by Adonis Yatchew and Yves Smeers

As electricity industries worldwide move toward restructuring, rationalization and increased competition, a variety of factors are combining to increase the prominence of distributed resource alternatives. These factors include: increased cost-effectiveness of small-scale generation; reduced confidence in long lead-time large-scale projects; increased pressure to find cost savings; changing regulatory relationships; new developments in technology; growing emphasis on environmental factors; and greater uncertainty about long-term load growth. This new special issue examines the emerging distributed resources paradigm. The DR paradigm promises to increase efficient use of resources by tailoring resource acquisition and rate design to local conditions. Several distinguished authors present their views in this concise, balanced and readable primer to the DR paradigm.

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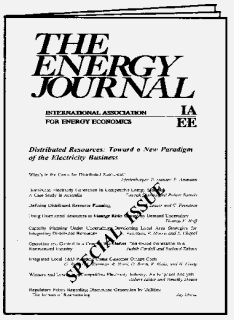
ABOUT THE EDITORS: Dr. Adonis Yatchew is professor of economics at the University of Toronto, and joint editor of The Energy Journal. Professor Yves Smeers of the Catholic University of Louvain has been lecturing for 25 years, chiefly in Industrial Engineering, and has written over 50 major articles in this field. He has served as a consultant for international organizations and various energy companies in Belgium, Canada, France, Germany, Norway and the UK.



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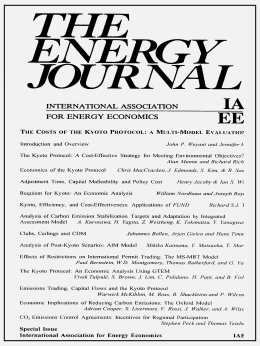
ABOUT THE EDITOR: John P. Weyant is a professor of engineering-economic systems and Director of the Energy Modeling Forum (EMF) at Stanford University. His current research focuses on analysis of global climate change policy options and models for strategic planning.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Energy Economics: A Modern Introduction. By Ferdinand E. Banks, 288 pages. Price: $125.00. Contact: Kluwer Academic Publishers Order Department, PO Box 322, 3300 AH Dordrecht, The Netherlands. Phone: 31-78-6392392. Fax: 31-78-6546474. Email: orderdept@wkap.nl

Oil & Gas Finance Review 2000. Price $170.00. Contact: Euromoney Institutional Investor Plc, 11 North Hill, Colchester, Essex CO1 1DZ, UK. Phone: 44-171-779-8999. Fax: 44-1206-560-121. URL: www.euromoneyplc.com

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Calendar

5-6 June 2000, Deepwater Oil and Gas in the Gulf of Guinea. Hotel Le Parc, Paris, France. Contact: Jonathan Neale. Phone: 44-2-7704-6241. Fax: 44-2-7704-8440. Email: jneale@thecwcgroup.com URL: www.thecwcgroup.com

5-6 June 2000, Mocambique Energy & Development Forum 2000. Johannesburg, South Africa. Contact: Global Pacific & Partners International, Houston: Phone: 281-597-9578, Fax: 281-597-9589. South Africa: Phone: 27-11-782-3189, Fax: 27-11-782-3188. Email: babette@global.co.za URL: www.glopac.com

7-9 June 2000, DEWEK 2000 - 5th German Windenergy Conference. Municipal Hall Wilhelmshaven, Germany. Contact: Deutsches Windenergie-Institut, Ebertstr. 96, D-26382 Wilhelmshaven, Germany. Phone: 49-4421-4808-0. Fax: 49-4421-4808-43. E-mail: dewi@dewi.de URL: www.dewi.de

7-10 June 2000, 23rd IAEE International Conference. Sydney, Australia. Contact: IAEE Headquarters, 28790 Chagrin Blvd., Ste. 350, Cleveland, OH 44122. Phone: 216-464-5365. Fax: 216-464-2737. E-Mail: iaee@iaee.org URL: www.iaee.org

11-13 June 2000, CERI 2000 Petrochemical Conference. Kananaskis, Alberta, Canada. Contact: April Wright, CERI, #150, 3512 – 33 Street, NW, Calgary, Alberta, T2L 2A6, Canada. Phone: 403-282-1231. Fax: 403-284-4181. Email: ceri@ceri.ca

11-15 June 2000, 16th World Petroleum Congress. Calgary, Alberta, Canada. Contact: 16th World Petroleum Congress, c/o Canadian Energy Research Institute, 150, 3512 – 33 Street, NW, Calgary, Alberta, Canada, T2L 2A6. Fax: 403-289-2344. Email: wpc2000@ceri.ca

12-13 June 2000, Turkey Power & Water. Istanbul, Turkey. Contact: Ms. Dawn Seet, Event Co-ordinator, 80 Marine Parade Road, #13-02 Parkway Parade, Singapore 449269. Email: dawn@cmtsp.com.sg Phone: 65-345-7322. Fax: 65-345-5928.

12-13 June 2000, Asia Coal vs. Gas. Singapore. Contact: Ms. Dawn Seet, Event Co-ordinator, 80 Marine Parade Road, #13-02 Parkway Parade, Singapore 449269. Email: dawn@cmtsp.com.sg Phone: 65-345-7322. Fax: 65-345-5928.

12-23 June 2000, International Training Program on Utility Regulation and Strategy. Gainesville, Florida. Contact: Public Utility Research Center, PO Box 117142, Matherly Hall 205, University of Florida, Gainesville, FL 32611. Phone: 352-392-6148. Fax: 352-392-7796. Email: purcecon@dale.cba.ufl.edu URL: www.cba.ufl.edu/eco/purc

18-20 June 2000, Energy Conference and Exhibition of Europe, Latin America and the Caribbean – Eurolac 2000. Cartagena de Indias, Colombia. Contact: OLADE, Ave. Mariscal Antonio Jose de Sucre No. 68-63 & Fernandez Salvador, OLADE Bldg., San Carlos Sector, Quito, Ecuador. Phone: 593-2-531675. Email: eurolac@olade.org.ec URL: www.olade.org.ec

18-23 June 2000, Gas Markets in Transition: Challenges & Opportunities (Training Course). Cricklade Wiltshire, England. Contact: Margaret Coen, The Alphatania Partnership, Rodwell House, 100 Middlesex Street, London E1 7HD, United Kingdom. Phone: 44-20-7650-1405. Fax: 44-20-7650-1401. Email: training@alphatania.com, URL: www.alphatania.com

19-20 June 2000, Breakthrough Strategies for Marketing, Pricing & Unbundling Utility Retail Services. Washington, DC, USA. Contact: Mark Thabet. Phone: 212-661-3500. Fax: 212-599-5192. Email: mthabet@iirny.com

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5-7 July 2000, Energy in a Competitive Market, Guildford, Surrey, UK. Contact: Phone: 44-1483-876960. Fax: 44-1483-259548. E-mail: SEEC@surrey.ac.uk. URL: www.surrey.ac.uk/dhawdon/seec

6-7 July 2000, The Economics, Geopolitics and Investment Terms in the Middle East Summit. Trianon Palace, Versailles, Paris, France. Contact: Jonathan Neale. Phone: 44-2-7704-6241. Fax: 44-2-7704-8440. Email: jneale@thecwcgroup.com URL: www.thecwcgroup.com

6-7 July 2000, Adapt or Die – Transforming your Power Company into an eBusiness. London, UK. Contact: Samantha Jays, dmg World Media, Queensway House, 2 Queensway, Redhill, Surrey RH1 1QS, United Kingdom. Phone: 44-1737-855-380. Fax: 44-1737-855-283. Email: sjays@dmg.co.uk

23-28 July 2000, GlobeEx '2000 Conference & Tradeshow, Las Vegas, USA. Contact: GlobeEx 2000, 2330 Paseo Del Prado, C101, Las Vegas, NV 89102. Phone: 702-317-0777. Fax: 702-257-7999. URL: www.globeex.com

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

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