



that the initial research, which explores the general practices and trends, will be completed by the end of March.

The R&D Task Force will share its results within IGU and also with a broader community of policy makers, researchers and industrial partners, for example through participation in relevant conferences, publication in relevant journals and direct communication. The Chairman gave a presentation entitled "R&D Task Force: R&D Requirements for the Gas Chain" during the meeting of the Coordination Committee in Cape Town on October 28, 2003. In this presentation he addressed the issues and actions that were agreed by the Task Force during its first meeting. The Chairman also submitted abstracts for the World Energy Congress (WEC) to be held in September and for the International Gas Research Conference (31 October-3 November). The abstract for WEC will be followed by a paper that summarises the achievements of the Task Force so far. Furthermore, the Chairman presided at the European Industrial Research Management Association (EIRMA) round table meeting on "R&D and Marketing in Service and Manufacturing Industries" that was held in Paris on December 4, 2003. During this meeting information and data were gathered on R&D needs, challenges and practices in a number of service industries, such as communications, energy, transport and water supply chains.

● Task Force Information and Communication Technology

Véronique Durand-Charlot was appointed Chairwoman in late November 2003 and the ICT Task Force is under constitution. She is Vice President of Gaz de France, in charge of procurement and IT.

The first members to be appointed are: Mr Eric Dam (Director of Business Support of Gastransport Services, the Netherlands); Mr Seung-Hwan Lee (Chairman of the ICT2005 National Organising Committee, Korea); Mr Yoshihiro Hatano



The collaboration portal is a vital tool.

(representing WEC); Mrs Olga Solarikova (who organised the last conference in Prague); and Mr Alain Bernard (Gaz de France), one of the co-workers of Mrs Durand-Charlot, will be Secretary of the Task Force.

Another Korean acquainted with the IT industry will be nominated and the completed Task Force will have between 10 and 12 members. The collaboration portal will be used for exchanges as soon as all the members have been appointed.

The first meeting of the task force was due to be held in February 2004 in Seoul. This will be followed by meetings at the end of April to prepare the call for papers and in September to choose the papers.

The work has only started but the Task Force has listed ideas for the ICT congress. The National Organising Committee in Korea has already started work on its organisation, the budget and promotion.

● Special Projects

On behalf of the Royal Dutch Gas Association (KVGN) and the Dutch gas industry, three Special Projects will be initiated: one concerning sustainable development, one concerning



regulation in different regions of the world and one concerning the expected growth of the gas market for power generation. These issues are inter-related and a particular aim is to clarify the roles of industry and government in realising a responsible energy future. For example, achievements on sustainability are dependent on regulation policies (emissions, pricing) and power policies (fuel-mix, security of supply). The overall theme of the Special Projects is summed up by their slogan "Market where possible, government where necessary".

The results of the project work will be reviewed on at least three occasions. The first will be at the 4th Latin American and Caribbean Gas and Electricity Congress in Brazil in April and the second at a regional conference focusing on Asia, which will be held in Malaysia in 2005. Finally, at the World Gas Conference in 2006 in Amsterdam, the focus will be a global view on these matters, including the European and North American markets.

The interaction among stakeholders, industry, government and customers is an important element in these projects. The key factor linking the issues in the projects lies in the process of engaging these parties in an integrated approach to achieve a joint understanding of the critical success factors in each of the three areas. The respective IGU committees will play a crucial role in providing the projects with the view of the gas industry on these issues. The projects will be coordinated from the Netherlands and will engage the Dutch gas industry, universities and institutes, but local specialists in the global regions may be invited to participate.

● Sustainability

IGU is a prominent actor in the international energy debate, an effective representative of the interests of its members and a forum for exchange of knowledge and experience. IGU will promote the view that gas is the fuel of choice and will contribute to creating the business environment to realise this vision. In the next decades the global

demand for energy will grow, whereas the contribution of renewable energy sources will be limited. As the cleanest fossil fuel natural gas can play a crucial role in reducing the global CO₂ problem by reducing energy emissions. IGU is seeking to underpin and illustrate its arguments and is seeking support and cooperation to implement the role of natural gas.

IGU has adopted Guiding Principles for Sustainable Development. The gas industry will integrate economic, environmental and social factors in its business practices. The gas industry will continuously improve its performance and support and encourage clean and efficient gas utilisation as well as the combined use of natural gas and renewable energy sources. The gas industry will cooperate with all parties involved in the gas chain and develop an open dialogue with stakeholders.

Objectives

The main objective of the Sustainability Special Project (SSP) is to develop, enhance, communicate and implement the vision "Gas as the fuel of choice" based on IGU's Guiding Principles for Sustainable Development. The vision has to show what contribution natural gas may bring to sustainability in different parts of the world in the next decades, identify key success factors and design a bridge towards a sustainable energy system. The design of the bridge (transition) should encompass a time-frame and elaborate on the role of energy efficiency, (de)centralisation of the energy-structure, migration towards "green" gas and hydrogen and the relation between natural gas and renewable energy sources (such as solar and wind).

This main objective requires the supporting instruments of practical implementation and knowledge transfer.

SSP intends to start a limited number of projects that show the new horizons. These projects must illustrate a relevant part of the vision and the

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CHP/co-generation will be one of the areas examined in the Sustainability Special Project. This is the co-generation plant at New York's JFK airport, a project that involved redeveloping the original central heating and refrigeration plant and adding 107MW of electricity generating capacity. The turbine generators are gas-fired and the heating and refrigeration equipment operates almost exclusively on waste heat extracted from the exhaust of the gas turbines. The new building was wrapped around the 1957 plant, respecting the original concept of putting the machinery on display with upward-thrusting, slanted walls of blue-green glass to complement the vertical elements of the new smokestacks. It was designed by the New York architects, Hillier, and is operated by Calpine.

transition. So far three main areas have been identified. The first area is combined heat and power production (CHP) or co-generation. CHP is in itself an efficient energy-converter. Moreover, it provides options for a flexible and decentralised energy infrastructure and interesting links to renewable energy sources. In some parts of the world CHP is already an important market phenomenon. Extending this position, development towards small-scale installations (households) and integration with solar, wind and biomass are focus-points. CHP is an important link with the Special Project Gas to Power.

The second area is transportation. In some countries natural gas (mainly compressed – CNG – but also LNG) already has a significant market share and interest in other countries is increasing. The main areas of focus for CNG are urban transportation and heavy goods vehicles. These market segments provide the best opportunities for

improving local and global climate conditions by using CNG.

The third area is the combination of large-scale gas infrastructure and small-scale energy infrastructure to link local economies to international energy systems. This is especially promising for developing gas markets.

These projects will partly focus on technology, but at the same time will pay a lot of attention to marketing, government policy (institutional affairs) and public affairs. This perspective will also provide a link to the Special Project on Regulation. Where possible the projects will be combined with existing activities to meet time and financial constraints.

Knowledge transfer is necessary to be able to conclude with a robust vision and transition. It must be the feeder for discussions with stakeholders within and outside the gas industry. Also information must be made available and be communicated to enable dissemination of the vision and the

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project results. SSP intends to build on lasting knowledge networks. This requires an upgrade of the network within the gas industry (IGU), building a network between the industry and scientists and universities, and extending networks with stakeholders (governments, non-governmental organisations and customers).

Within SSP a follow-up of the Sustainable Urban Systems Design (SUSD) international competition of the 2000-2003 Triennium will be considered. (For more information on the SUSD project see pages 40-42 of *Seven Decades with IGU*.) The focus could be the implementation of natural gas applications within the long-term framework as developed by some of the contestants (such as Vancouver and New Delhi). Combination with the projects mentioned above would be very welcome and effective, while involving cities in the Netherlands and Argentina (the holder of the next IGU Presidency) would provide excellent opportunities for showcases. A proposal to that respect has been received from Sebastian Moffatt, the leader of the Vancouver winning team. This proposal is currently under consideration by the Dutch Presidency.

Organisation

SSP will be developed by the Dutch presidency. Gasunie will deliver the project team (Ulco Vermeulen, Tjerk Veenstra, Menno Groeneveld, Fons van Dam, Bert Coelingh and Erik Westdijk). An advisory board will support the project team. This advisory board consists of three excellent energy experts, Catrinus Jepma (University of Groningen), Sibebe Schone (WNF) and Jan-Paul van Soest (consultant).

The project team will cooperate with IGU's PGC A to ascertain that the scope of SSP is corresponding with PGC A, to exploit mutual benefits and to anchor the results of SSP within IGU. With regard to the projects SSP will also cooperate with WOC 2 (CO₂ sequestration) and WOC 5 (NGVs) to realise the maximum benefit to IGU.

SSP will execute the activities as mentioned above and will organise a number of regional brainstorming sessions and workshops to focus on the specific sustainability issues in those regions and to integrate regional and global sustainability into the vision and the transition of IGU.

● Regulation

This Special Project will look into the impact of regulation on investments, roles and responsibilities. Its objectives are to develop a vision, to promote knowledge transfer and to start an active dialogue with stakeholders.

A special study is foreseen of the regulatory impact on the Gas to Power and Sustainability projects.

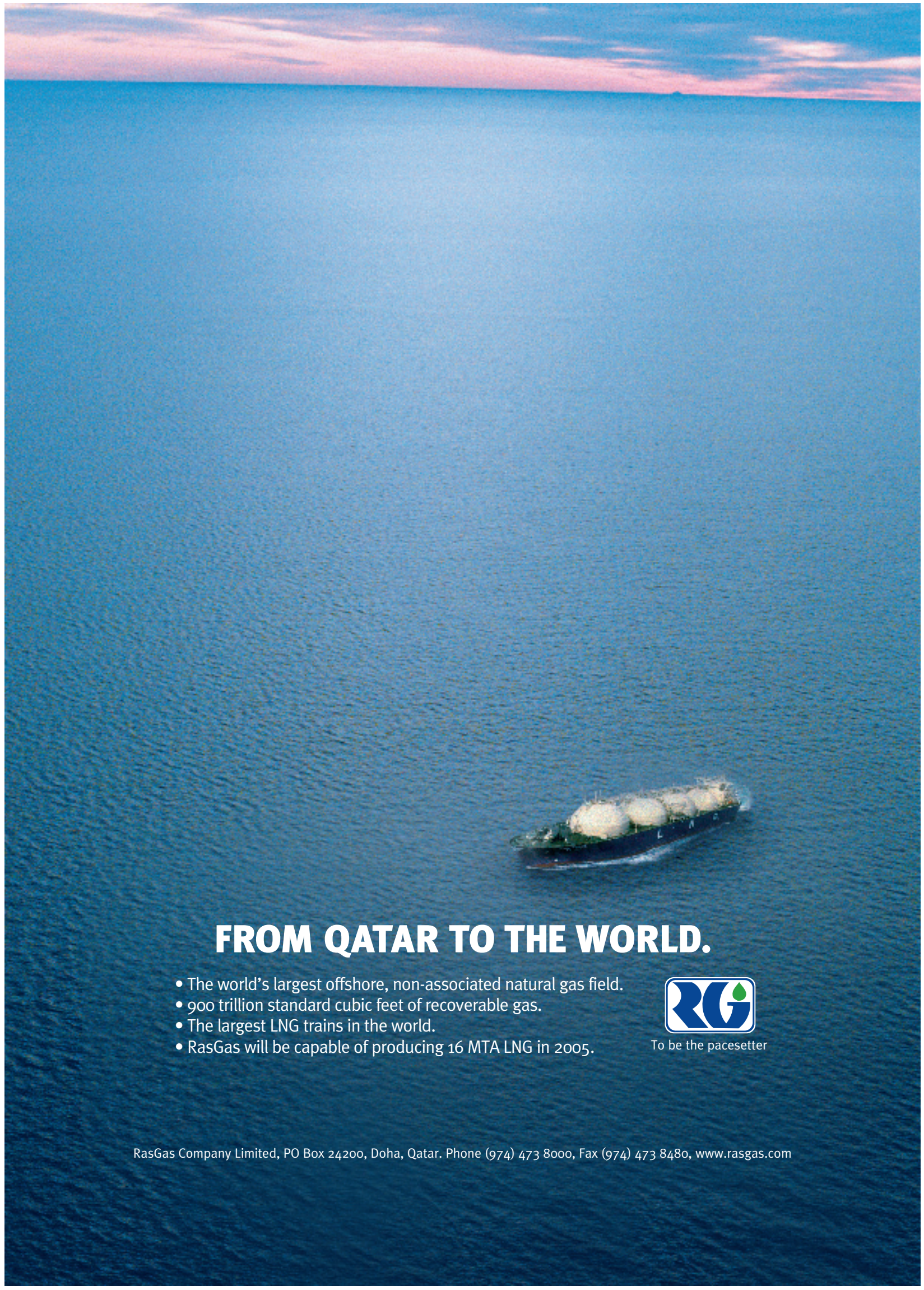
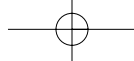
The deliverables for this project are a vision paper to be presented at the WGC2006 and contributions to regional workshops 2004-2006.

Studies and surveys will be part of the work that will be strongly supported by PGC B. We will produce papers for presentations at major conferences.

● Gas to Power

Projections made by the International Energy Agency (IEA) suggest that by 2020 the annual world gas market will have grown by 1600 bcm compared to the present market. Most of this growth, some 1000 bcm, will come from the electricity producing industry. This is a tall order in the best of circumstances and may only happen if all the stakeholders cooperate.

The objective of this Special Project is to start a dialogue with the power industry and governments, to identify success factors and address obstacles, and to achieve the fullest potential for gas. Planned activities include carrying out studies and surveys, organising workshops and taking part in conferences. Adopting a regional approach will allow a focus on the differences in market development and circumstances in different parts of the world. This will be done in cooperation with the IEA, the other Special Projects and IGU committees.



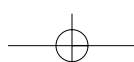
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International Cooperation

IGU cooperates with a number of related international organisations and also has contacts with energy-related projects. For LNG-related organisations please refer to the PGC D report on page 58.

● Cooperation with related international organisations

IANGV

The IGU CC Chairman also serves as the Vice President of the International Association for Natural Gas Vehicles (IANGV). Therefore, IGU was represented at the IANGV Council meeting held in Las Vegas in October 2003 and contacts between the two organisations will be increased.

As a first step IGU and IANGV worked together closely in preparing for and participating in the ninth session of the Conference of the Parties (COP 9) to the UN Framework Convention on Climate Change (UNFCCC). This was held in Milan, December 1-12, 2003.

Intergas Marketing

A memorandum of understanding has been signed with Intergas Marketing (IGM) and it is an affiliated organisation to IGU.

IGM is involved in studies on the optimum use of the results of client satisfaction surveys and best marketing practices. It is envisaged that studies on topics yet to be decided will be outsourced by IGU to IGM.

IGU was represented by the CC Chairman at the IGM annual meeting for 2003, which was held in Versailles on October 10-11.

World Energy Council (WEC)

IGU was represented at WEC's Executive Assembly, which was held in Kiev, September 9-16, 2003.

Contributions are foreseen from IGU to the WEC life-cycle analysis (LCA) studies.

WEC will have a seat on the IGU ICT programme committee.

Eurelectric

IGU is represented in the Eurelectric programme committee for the next annual conference, which will be held in June in Lyon.

Aspects of the role of gas in the fuel mix for power generation are promoted and contacts have been initiated regarding a contribution by Eurelectric to the Gas to Power Special Project.

World Petroleum Congress (WPC)

WPC will be a member of the IGU ICT programme committee and IGU will contribute to the 18th World Petroleum Congress in Johannesburg in 2005.

UNFCCC COP9

IGU organised a side event on natural gas vehicles during COP 9 in Milan. This was held on December 4 and involved contributions from Argentina, India and Italy. A poster on a virtual power plant promoting decentralised combined heat and power was also presented.

● Contacts with energy-related projects

NaturalHy Project

The possible use of existing pipelines for distributing mixtures of natural gas and hydrogen offers a unique and cost-effective opportunity to initiate the progressive introduction of hydrogen prior to the development of a full hydrogen system. The aims of NaturalHy are to test all the critical components by adding hydrogen to natural gas in existing networks. This transitional approach will provide further experience with the transmission of mixtures of hydrogen and natural gas and, by means of innovative separation technologies, the utilisation of hydrogen in stationary end-use applications.

A systematic and coordinated approach for the generation of clear outcomes will be adopted in NaturalHy, with a comprehensive collection of work packages focusing on all vital components of



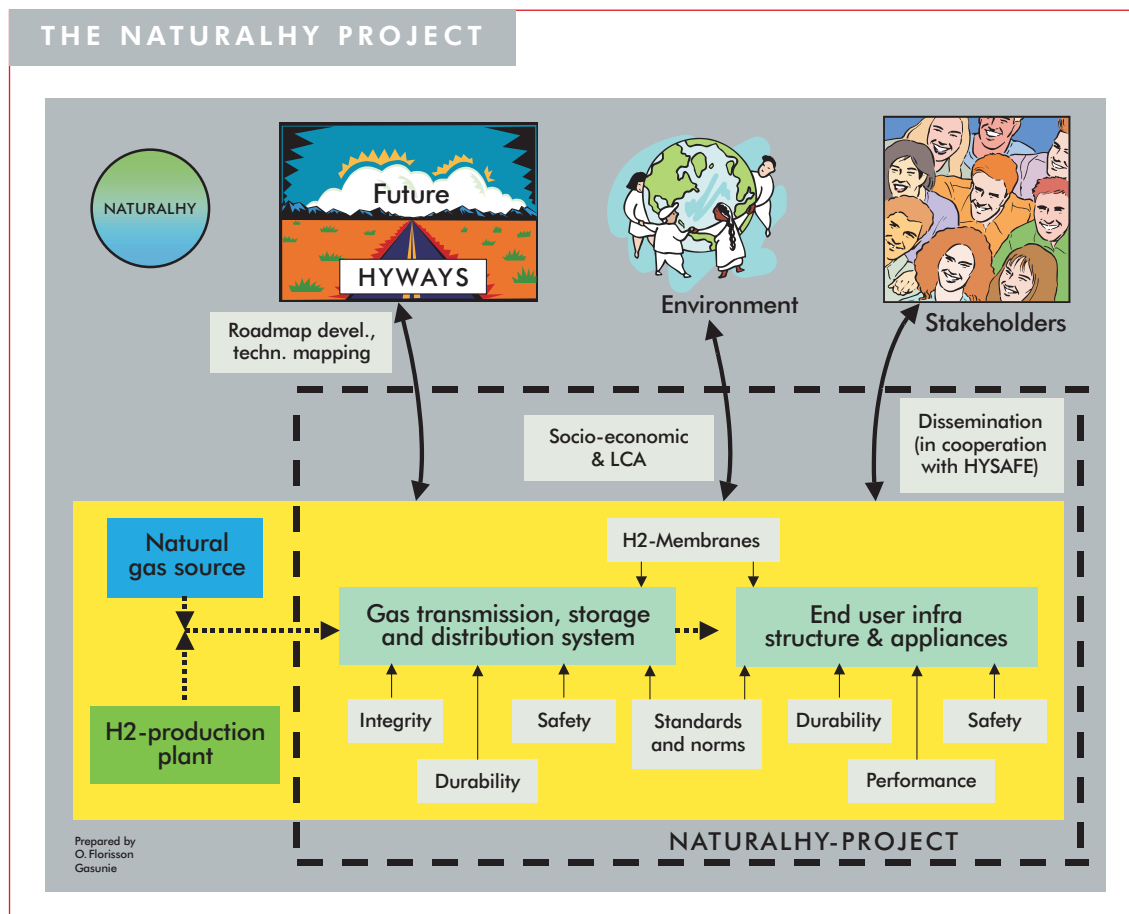
transitional hydrogen systems. A schematic view of the project is given in Figure 1.

A European consortium of 40 partners with extensive experience and skills has been assembled for NaturalHy, which involves major network operators, hydrogen producers, specialist practitioners and academic researchers in all relevant fields. Potential collaboration and synergies will be fostered with complementary projects also receiving support from the European Union such as HyWays (a project to create the instruments for establishing a European hydrogen energy roadmap) and HySafe (a project concerned with the safety of hydrogen as an energy carrier).

A strategic advisory committee has been set up to establish a platform for the dissemination of information and the development of public

awareness and understanding. It has a wide range of international representatives including IGU (represented by Dr Bob Harris), the International Energy Agency, the UK Health and Safety Executive, ministries of economic and environmental affairs, the European Natural Gas Vehicle Association, the Carbon Trust and the European Thematic Network on Hydrogen (HyNet), and is chaired by the Chairman of the European Committee for Standardisation (CEN).

NaturalHy is to be financially supported by the European Union, which will provide €11 million of the €17 million budget, and the final stage of the negotiation has started. The start of the project is planned for the beginning of 2004 and it will last five years. It will be coordinated by Onno Florisson of Gasunie Research.



LEFT Figure 1.



Annex

● Milestones and deliverables

Progress reports

- 2004 first half year July 31, 2004
- 2004 second half year December 31, 2004
- 2005 first half year July 31, 2005
- 2005 second half year December 31, 2005
- 2006 first half year May 15, 2006

Papers and reports

- *March 1, 2005*
Publication of call for papers
- *September 1, 2005*
Deadline for abstract submission and for the names of invited speakers
- *October 1, 2005*
Paper selection ready, authors to be notified
- *February 1, 2006*
Deadline for paper submission (including invited speakers) and for the submission of the committee reports

Presentations

For each meeting of the Coordination Committee each committee has to prepare a short (one A4 page) report on the progress of its work. These reports should be available on the collaboration portal one week before the meeting date.

- *September 14, 2004*
Deadline for Oslo meeting
- *April 8, 2005*
Deadline for Warsaw Meeting
- *October 10, 2005*
Deadline for Tianjin City meeting

● *March 3, 2006*

Deadline for Goa meeting
Presentations for the World Gas Conference in Amsterdam must be handed in at the authors' room the day before the session date at the latest.

The following items have been delivered so far: the Strategic Guidelines, the collaboration portal and the Triennial Work Programme.

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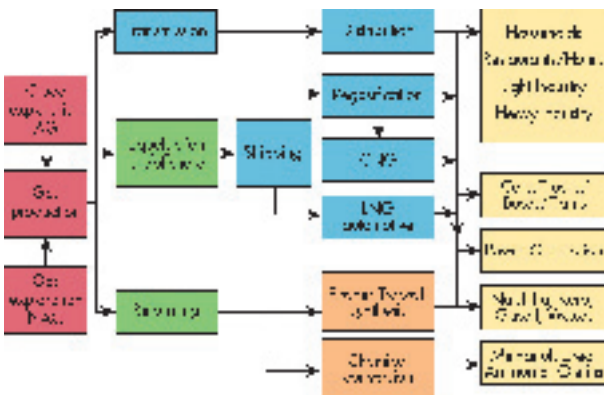
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Optimising Current and Long-term Gas-to-Market Schemes

By Frithjof Kublik, Product Manager Gas Masterplanning, Shell Global Solutions International BV

With reserves of gas forecast to outlast those of oil, and with increased pressure to reduce flaring, there are sufficient drivers to force companies to improve the efficiency of their gas value chains. These companies need to maximise the long-term value of gas reserves (in many cases a mix of associated and non-associated gas) and, at the same time deliver the greatest benefit to stakeholders by integrating oil, gas, power, chemicals and other hydrocarbon assets.



The difficulty with gas has always been balancing the costs of production, transport, processing, storage and market development with the ultimate commercial value of the gas. Gas Masterplanning is a process developed by Shell Global Solutions that coordinates input from one end of the gas value chain to the other. A Gas Masterplan helps oil and gas companies to optimise the gas production process, from pipeline infrastructure and gas plants right through to the market.

► The Gas Masterplanning process

There are typically three stages:

► Align stakeholders

In the first stage of Gas Masterplanning, the targets are to align the different stakeholders, to clarify the business needs, and for all the stakeholders to have a clear understanding of, and support for, the deliverables. This also includes the required management commitment from the customer's staff to participate in the Gas Masterplanning work.

► Squeeze assets

In situations where several assets are already operational or definitely planned, Gas Masterplanning moves on to a detailed review of the hydrocarbon resources and the final products to optimise their market value. Issues such as operational process improvement, plant and infrastructure debottlenecking, rerouting of production streams, optimum product mix, and waste and environmental management are addressed. Normally, a five-year horizon is considered for short-term improvements – typically referred to as quick wins.

► Build the future

The final gas master plan shows the envisaged development scenarios for the business, together with the opportunities and threats resulting from changes in the business environment. The gas master plan will detail the feasible and practicable alternative strategies available, the decision points between conflicting strategies and the recommended course of action.

Gas Masterplanning for LNG



► People skills

The challenge for the gas industry is combining commercial skills with knowledge of the evolving new technologies. A broad base of knowledge is required ranging from research to specific proven gas technology expertise such as in liquefied natural gas (LNG) and gas-to-liquids (GTL) processes. In addition, top engineering, day-to-day operational and project management skills for such large projects

are used in combination with in-depth commercial gas business experience. Local skills need to be extended by experienced staff from Shell Global Solutions and formed into a joint team.

► **Gas planning tools**

The commercial issues of Gas Masterplanning cover the value of removing bottlenecks or adding plants, and the analysis of sensitivities in areas such as gas supply and demand or prices in key markets.

Part of the Gas Masterplanning process is building a high-level, integrated gas-flow optimisation model that allows consistent mapping of the technical and commercial issues throughout the complete gas value chain. The model encompasses the gas production process, the composition of the different gas streams as they progress through gas processing plants, gas pipeline infrastructure and compressor stations via gas commercialisation schemes such as LNG or GTL power generation through to delivery of the final product to the customer.

Gas Masterplanning value chain model

Principal model key is to optimise the value chain for maximum net US\$



The model also visualises the economic drivers and key constraints in the existing gas network system and helps companies to identify alternatives for removing constraints or investing in new assets. The model is an important part of Gas Masterplanning as it helps companies to understand the links across the gas value chain. This helps to

prioritise different margin-improvement opportunities for establishing an action plan based on added value in US dollars for each opportunity.

► **Gas Masterplanning in practice**

In recent years, Shell Global Solutions has added value for many customers around the world by using the Gas Masterplanning approach in different problem areas of the gas business.

Removing constraints allows producing more condensate in the Far East

An integrated analysis of the existing assets and constraints was performed for a gas venture with a large existing gas business in the Far East in order to prioritise key value-adding improvement possibilities. The study revealed that additional condensate could be produced, and more than \$200 million additional net present value could be realised. This type of analysis draws on in-depth technical capabilities in estimating capacities and using best available technology for debottlenecking activities.

West African gas venture benefits from infrastructure improvements

An integrated gas master plan that evaluated different options for commercialisation of associated and non-associated gas was developed for a West African gas venture to help meet the flaring-out target. A comparison of investment in a greenfield GTL or LNG plant with investment in pipeline infrastructure and, at the same time, expansion of an existing LNG plant with additional trains yielded an investment advantage of more than \$500 million for the preferred option.

To assess such a large gas network in detail, a tool was developed that would map the key gas compositions throughout the gas infrastructure from the supplying gas field to the domestic gas user or gas commercialisation plants at the receiving end. The model also included facilities such as gas processing plants. Even though being modelled at a high level, the key gas properties

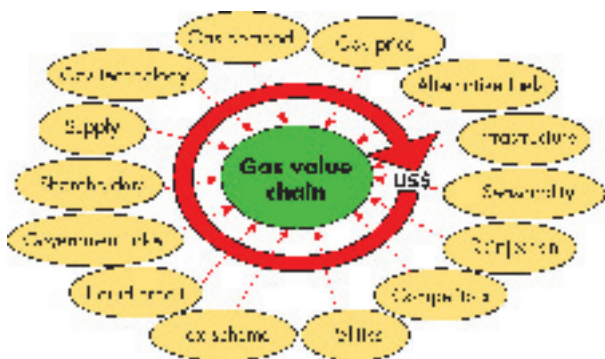
(composition) could still be tracked throughout the system and the main requirements at the receiving end incorporated to help optimise the system.

Energy review shows competitive positioning of domestic gas in East Asia

An energy review carried out for an East Asian gas company aimed to position gas in relation to alternative fuels for use in heat and power production. The work encompassed gas production, transmission and distribution to the end-user and included benchmarking against mature European gas markets, cost estimating of the equipment necessary for gas distribution, and incorporation of seasonal changes in energy demand. Security of supply and social sustainability, especially in relation to the balance of employment, were important, additional factors.

Masterplan helps to develop long-term regional gas business overview

The long-term prospects for the gas business between Europe, Russia, Central Asia and China were evaluated for a large integrated oil and gas company. Numerous factors influence the gas business along the value chain. There are hard factors such as current gas production profiles, cost of gas supply, and current gas demand, existing pipeline infrastructure and current gas prices. There are also soft factors such as political climate within and between different countries and all kinds of competitor activity. Together, both types of factor determine the final economic investment

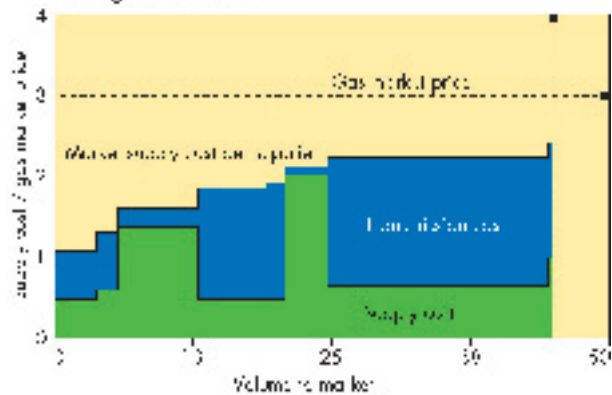


decisions. The challenge is to integrate and balance all these factors – a good way to approach this is by building scenarios that offer a consistent view for different sequential developments over time through key signposts.

The approach used for the analysis was two-fold:

- ▶ **Strategic analysis** was used to develop a consistent view of the future that included key political decisions. The scenario technique was used in combination with an analysis of the key stakeholders and competitors to derive a view of how the gas business could develop.
- ▶ **Integrated gas value chain analysis** yielded a long-term view for the next two decades on the competitive positioning of key supply sources and how the gas could flow into the key markets. Optimised gas flows based on the economics covering the technical costs into the market versus market prices were used. The key technical constraints included were either for gas supply potential or for the transmission capacities.

Optimised supply cost curves into gas markets



This analysis yielded an integrated overview of key bottlenecks of the current gas system and enabled cost curves to be generated for each gas market with specific gas supply sources. Such an analysis enables new gas pipeline requirements to be developed over time using a combination of political signposts and underlying economics. With these capabilities, the focus can be on new business development initiatives. Continuous what-if evaluations can be quickly carried out to enable consistency checks.

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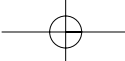
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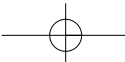


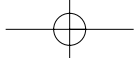
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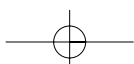
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FEATURES

This section of the magazine contains a range of feature articles on topical issues in the gas industry. In this edition we look at the international LNG trade, the IGU Special Project on Gas to Power, the legacy of Enron, a new regional gas conference, NGVs and the first preparations for the 23rd World Gas Conference. We round up with a description of the publications and documents available from IGU and an events calendar.



Nigeria LNG: A Profile

► The Company

Nigeria LNG Limited was incorporated as a limited liability company on May 17, 1989, to harness Nigeria's vast natural gas resources and produce liquefied natural gas (LNG) for export.

In November 1995, a Final Investment Decision was taken by the shareholders – Nigerian National Petroleum Corporation (NNPC), Shell Gas B.V., Total and ENI International (N.A.) N.V. – to build an LNG plant in Finima, Bonny Island, Rivers State. Construction work commenced in February 1996, and today the plant site houses three trains with combined capacity of 9 mtpa of LNG and 1.2 mtpa of condensate. All three trains have the flexibility to use 100% associated gas feedstock.

NLNGPlus will further expand the Nigeria LNG complex by the addition of Trains 4 & 5, producing a further 8.0 mtpa of LNG and 1.5 mtpa liquefied petroleum gas (LPG) and condensate. Trains 4 & 5 will start-up in June and December 2005 respectively.

On completion of the NLNG Plus Project, the Nigeria LNG plant will have an overall capacity of 17 mtpa of LNG, 3.4 mtpa of LPG and condensate, requiring a total of 78.4 million cubic metres per day of natural gas feedstock.

Scouting studies for Train 6, also known as NLNGSix, are at an advanced stage with all the volumes already sold. The Final Investment Decision will be taken soon.

► Marketing

LNG long-term sales: Trains 1, 2 & 3

NLNG Limited has Sale and Purchase Agreements (SPAs) for 22½ years with Enel of Italy, Gas Natural SDG SA of Spain, Botas of Turkey, Gaz de France of France (GdF) and Transgas of Portugal.

LNG long-term sales: Trains 4 & 5

NLNGPlus will produce 4.1 mtpa LNG and 0.5 mtpa LPG. Off takers include Shell Western LNG, Total, Iberdrola (Spain) and Transgas for European and US destinations.

Condensate sales

Nigeria LNG Limited has also been marketing its condensate through term FOB contracts of 12 months'

duration, following an international bidding exercise.

The first two such contracts were signed with Shell Western Supply & Trading Company Limited. The third was with Vitol. The company has a current contract with Trafigura Beheer B.V., which expires in September 2004.

LPG

NLNG began exporting LPG in June 2003, which is sold FOB under 12 month-term contracts.

► Shipping

Ten ships with cargo capacities of between 120,000 and 135,000 cubic metres are used for transporting LNG from Bonny Island to buyers. Nine are owned by NLNG through its wholly owned subsidiary – Bonny Gas Transport Limited (BGT) – while the tenth, *LNG DELTA*, is chartered on a long-term basis from Shell Bermuda Overseas Limited. Eight more vessels will be required for NLNGPlus while for train 6, NLNG will charter six more vessels.

► Community relations

Nigeria LNG Limited is implementing a community relations policy premised on stakeholding for sustainability. The company supports projects that communities need and are able to demonstrate ability to sustain. This concept ensures a long lasting partnership between the company and the community with mutually beneficial results.

► Nigerianisation

A Nigerianisation scheme was agreed on September 1, 1997 between NLNG and its shareholders. Without compromising quality, the ultimate objective is to Nigerianise the company's workforce and increase local content.

► The future

With Train 6, NLNG will have capacity to produce 22 million tonnes of LNG and 4.6 million tonnes of gas liquids yearly. In cargo terms, LNG cargo from the six-train plant will require a fleet of 24 ships. With these, Nigeria LNG will implement one of the fastest expansion programmes in the LNG industry.

The Secret of Our Success



- Good geographical location
- Abundant gas reserves
- World's fastest growing LNG project
- Owner of world's fastest growing LNG fleet
- A reliable LNG supplier in the Atlantic basin
- Reputable shareholders - NNPC, Shell, Total & ENI
- Top indicative credit ratings from renowned credit agencies
- Excellent due diligence reports on community relations, gas reserves, etc from reputable organisations
- World class health, safety and environmental records

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...Helping to put out gas flares in Nigeria



The Dynamic World LNG Trade

By Colleen Taylor Sen

As representatives of the world gas community prepare to meet in Doha at the triennial forum for the exchange of information on liquefied natural gas (LNG-14), they will be discussing an international market that has enjoyed 40 years of steady growth. In 2002 some 12 countries exported 113 million tonnes (~156 billion cubic metres of natural gas) of LNG to 11 nations – up 5% over 2001. According to initial estimates, in

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Table 1.

PROVED NATURAL GAS RESERVES, JANUARY 1, 2003

Country	Proven Reserves (billion cubic metres)	Country	Proven Reserves (billion cubic metres)
Russia*	47,000	Kazakhstan	1900
Iran*	26,500	Uzbekistan	1850
Qatar ^{LNG}	25,783	Canada	1700
Saudi Arabia	6540	Egypt*	1657
Abu Dhabi ^{LNG}	5620	Netherlands	1567
United States ^{LNG}	5300	Kuwait	1557
Nigeria ^{LNG}	5055	Azerbaijan	1370
Algeria ^{LNG}	4523	Libya ^{LNG}	1314
Venezuela*	4195	Ukraine	1110
Australia ^{LNG}	3930	Oman ^{LNG}	946
Indonesia ^{LNG}	3825	Bolivia*	813
Norway*	3667	India	790
Iraq	3190	Pakistan	750
Turkmenistan	2900	Argentina	664
China	2600	Trinidad ^{LNG}	589
Malaysia ^{LNG}	2478	Total World Reserves	180,596

Source: Cedigaz LNG = Currently exports LNG * = Potential LNG exporter

2003 production increased 9% to a record 123 million tonnes as new trains in Trinidad and Tobago and Malaysia increased world liquefaction capacity to 135 million tonnes. In the longer term, the world LNG trade is projected to reach between 200 and 350 million tonnes/year (mta) by 2020 – a wide range that illustrates the many uncertainties connected with the industry, especially price, politics and economic growth rates.

● Reserves and export projects

To a large extent, this growth is supply driven. Proved global gas reserves are estimated at more than 180 x 10¹² cubic metres as of January 1, 2003, up 13% from a year earlier. Much of this gas is located in regions without access to markets; conversely, some major gas consuming areas, especially Japan, Korea and parts of India and China, do not have their own gas supplies. In the case of Europe and the United States, LNG supplements domestic production and pipeline imports.

Natural gas can be delivered to market via pipeline, as LNG, or by conversion to liquids. Despite LNG's growth, three-fourths of the international natural gas traded is still delivered via pipeline and competition between LNG and pipeline is intensifying, especially as regards India and China, and even in the cases of Japan and Korea. Generally LNG deliveries become cheaper than pipeline deliveries when the distance is more than 2000 kilometres for offshore pipelines and 3800 kilometres for onshore lines. The conversion of gas to liquids is moving ahead rapidly; several countries, notably Qatar, are developing demonstration and commercial projects, the first of which will go online in late 2005.

As Table 1 indicates, around half of reserves are located in countries that currently export LNG or are potential exporters. It is interesting to note there is not a clear relationship between the size of a country's reserves and whether it is an LNG importer or exporter. For example, India and China

LIQUEFACTION PLANTS OPERATING AS OF NOVEMBER 30, 2003

Country	Plant Name	Companies	No. of Trains	Production Capacity (mta) (Actual production in parentheses)	Major Buyers	Planned Expansions
Abu Dhabi	Das Island	Abu Dhabi Gas Liquefaction Co., Ltd.: (ADNOC 51%, BP 16.33%, Total 8.17%, Mitsui 24.5%)	1&2 3	6.0	Tokyo Elec.	
Algeria	Arzew – GL1Z	Sonatrach	6	7.9	Gaz de France,	
Algeria	Arzew – GL2Z	Sonatrach	6	8.3	Gas Natural,	
Algeria	Camel – GL4Z	Sonatrach	3	0.9	Botas, Tractebel, ENEL, Depa	
Algeria	Skikda GL1K & GL2K	Sonatrach	6	5.0		
Australia	North West Shelf Project	North West Shelf Joint Venture (BHP Billiton, ChevronTexaco Aust., Shell Devpt. Aust., BP Devpt. Aust., Woodside Energy, Japan Aust. LNG (Mimi), each 1/6)	3	7.5	Tokyo Elec., Chubu Elec., Kansai Elec., Chugoku Elec., Kyushu Elec. Tokyo Gas, Osaka Gas, Toho Gas	Train 4, up to 4.2 mta, 2004 startup
Brunei Darussalam	Lumut	Brunei LNG (Brunei govt. 50%, Shell 25%, Mitsubishi 25%)	4 1	7.2	Tokyo Elec., Tokyo Gas, Osaka Gas, Korea Gas	
Indonesia	Arun	PT Arun NGL Co. (Pertamina 55%, Mobil 30%, JILCO 15%)	4	12.8 (6.6 est'd)	Tokyo Elec., Tohoku Elec., Korea Gas	
Indonesia	Bontang	PT Badak NGL (Pertamina 55%, VICO 20%, TotalFina Elf 10%, JILCO 15%)	A&B C&D E F G H	22.1	Kansai Elec., Chubu Elec., Kyushu Elec., Osaka Gas, Toho Gas, Nippon Steel, Tokyo Gas, CPC, Korea Gas	Train 1 problematic
Libya	Marsa el Brega	Sirte Oil Co.	3	0.6	Gas Natural	
Malaysia	Bintulu	Malaysia LNG Sdn. Bhd. (Petronas 95%, Sarawak state govt. 5%); MLNG Dua: (Petronas 60%, Shell 15%, Mitsubishi 15%, Sarawak 10%); MLNG Tiga (Petronas 60%, Shell 15%, Nippon Oil 10%, Sarawak 10%, Diamond Gas 5%)	MLNG Satu 3, MLNG Dua 3, MLNG Tiga 2	7.6, 7.8, 6.8, 22.2	Tokyo Gas, Tokyo Elec., Other Japn. Utilities, Korea Gas, Chinese Petroleum	
Nigeria	Nigeria LNG	Nigeria LNG Ltd. (NNPC 49%, Shell 25.6%, Elf 15%, Agip 10.4%)	3	8.7	Enagas, Enel, Botas, GdF, Transgas, Gas Natural	Trains 4 & 5 = 7.5 mta by end 2005 Train 6 = 3.7 mta
Oman	Oman LNG	Oman govt. 51%, Shell 30%, Total 5.5%, Korea LNG 5%, rest Mitsubishi, Mitsui, Partex, Itochu	1 1	3.3 3.3	Osaka Gas, Kogas, spot sales to Europe and US	
Qatar	Qatar Liquefied Natural Gas Co (Qatargas)	Qatar Petroleum 65%, ExxonMobil 10%, Total 10%, Marubeni 7.5%, Mitsui 7.5%	3	8	Chubu Elec., 7 Japanese utilities; spot sales to Europe and US	Debottlenecking: 1.5 mta by end 2005
Qatar	Ras Laffan LNG Co.	Qatar Petroleum 66.5%, ExxonMobil 26.5%, Itochu 4%, LNG Japan 3%	3	11.3	Korea Gas, Petronet; spot sales to US and Europe	RasGas II (QP70%, Exxon Mobil 30%). Train 1: 4.7 mta, 2004 Train 2: 4.7 mta 2005
Trinidad	Atlantic LNG Co.	Train 1: BP 34%, BG 26%, Repsol 20%, Cabot 10%, NGC 10% Trains 2&3: BP 42.5%, BG 32.5%, Repsol 25%	3	9.6	Tractebel, Gas Natural, BP, BG, Repsol, Gas d'Euskadi	Train 4 under construction = 5.2 mta by end 2005
U.S.	Kenai	ConocoPhillips 70%, Marathon 30%	1	1.9 (1.73)	Tokyo Gas, Tokyo Elec.	
Total			64	131.7		

Source: Gas Technology Institute, World LNG Source Book 2001 and revisions

Table 2.



have larger gas reserves than Trinidad and Tobago, but their gas is located far from consuming centres, so that they are forced to import LNG. Trinidad and Tobago, a small country, is rapidly advancing to the ranks of top LNG exporters in part because of its government's commitment to resource development. Indeed, the role of local, national and international political will in promoting or discouraging LNG projects cannot be underestimated. In October 2003 a plan to export gas from Bolivia was halted by riots, while local opposition has blocked the construction of LNG terminals in the US and Europe.

Currently 12 countries export LNG from 15 liquefaction complexes (see Table 2). New projects under construction in Australia, Russia, Norway

and Egypt together with planned expansions of existing facilities will increase annual capacity to nearly 200 mta by 2007 (Table 3), some 10% of global gas consumption. Qatar, Nigeria, Indonesia and Australia are looking at not only expansions but also at new greenfield projects. Moreover, Iran, Yemen, Equatorial Guinea, Angola, Venezuela, Bolivia and Peru are considering LNG exports as a way of monetising their gas resources.

● **Markets**

Table 4 shows LNG imports by country in 2002. The three Asian importers – Japan, Korea and Taiwan – relied on LNG for most of their natural gas supplies, whereas Europe and the US use LNG

RIGHT
Table 3.

LNG PLANTS UNDER CONSTRUCTION AS OF NOVEMBER 2003

Country	Company	Train No.	Vol. (mta)	Startup date	Buyers & Volumes (mta)
Trinidad	Atlantic LNG	4	5.2	End-2005	Spain, US
Nigeria	Nigeria LNG	4 & 5	7.6	2005	
Qatar	Ras Laffan LNG	3	4.7	2004	Petronet (Dahej)
Qatar	Qatargas	Debottle-necking	+2 mta	2002-05	Gas Natural
Malaysia	Malaysia LNG	2	3.4		Japex 0.5, Toho Gas, Tokyo Gas, Osaka Gas 1.16, Tohoku Elec. 0.9
Australia	North West Shelf LNG	4	4.2	2004	Tohoku Electric 0.4, Kyushu Elec. 0.5, Tokyo Gas, Toho Gas 1.0, Osaka Gas 1.0
Egypt	Segas (Damietta) (Union Fenosa, ENI)	1	5.0	Sept. 2004	Union Fenosa
Egypt	Egyptian LNG (Idku) (Egyptian General Petrol., EGAS, BG, Gaz de France, Petronas)	1 1	3.6 3.6	2006	Gaz de France Europe and US
Australia	Darwin LNG	1	3.6		
Russia	Sakhalin LNG	2	9.6		Tokyo Gas 1.1, Tokyo Electric 1.5-2, other Japanese utilities: 1.3
Norway	Snøhvit LNG (Statoil 22.3%, Total 18.4%, Gaz de France 12%, Norwegian state 30%, Norsk Hydro 10%, rest Amerada Hess, RWE Dea and Svenska Petroleum)	2	4.0		

Source: Gas Technology Institute



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Table 4.

LNG IMPORTING COUNTRIES, 2002			
Importing Country	Million tonnes	% of Total	% Change from 2001
Japan	54.25	48.03	-1.35
Korea	17.84	15.80	+10.66
France	10.57	9.36	+18.09
Spain	10.26	9.09	+30.35
US	4.83	4.28	-5.19
Puerto Rico	0.46	0.41	+12.51
Taiwan	5.36	4.75	+12.97
Turkey	3.70	3.27	+0.52
Belgium	2.73	2.41	+58.85
Italy	2.55	2.26	-4.17
Greece	0.38	0.34	-4.55
Total	112.93	100%	+5.89

Source: Groupe Internationale des Importateurs de Gaz Naturel Liquéfié (GIIGNL)

to supplement domestic supplies and pipeline imports. Japan remains the world's largest LNG importer: Its 23 LNG terminals received 54 mta in 2002, more than 95% of its total gas supply. This was down slightly from 2001; however, in the first nine months of 2003 Japanese imports rose more than 12% (in part because of a shutdown of many of its nuclear reactors) and were set to reach a record 60 mta in 2003. Korea's gas consumption rose nearly 6% to 14.7 mta in the first nine months of 2003 – somewhat slower than expected because of a drop-off in power generation.

Meanwhile, India was due to accept its first cargo from Qatar in January into Petronet's terminal at Dahej on the west coast. China will start importing LNG from Australia by 2007. Receiving terminals have been discussed for the Philippines, New Zealand and the island of Java in Indonesia.

In Europe LNG accounts for around 7% of total natural gas consumption, while 55% is imported via pipeline. Demand for LNG is rising, albeit slowly, and could account for 15% of the region's total natural gas demand by 2020. All European importers except Turkey are expanding their terminal capacity and planning new plants. In Spain, Europe's fastest growing gas market, LNG imports rose 30% in 2002 alone. The country's existing three terminals are being expanded and three new ones are being built, which altogether will expand total capacity from 20 mta to 35 mta by 2005.

Gaz de France, which operates two terminals at Fos-sur-mer on the Mediterranean and Montoir on the Atlantic, is planning to build a second plant at Fos-sur-Mer. Italy has only a single terminal operated by state-owned SNAM, but at least six more have been proposed or planned. Portugal began importing LNG into its first terminal at Sines in October 2003. The UK was the first country to import LNG in 1964 but dismantled its terminal in 1990. Now, faced with a prospective gas shortage, UK companies are building a 3-mta terminal near



Bolivians march to protest plans to export natural gas. The protests culminated in a general strike and the ousting of President Gonzalo Sanchez de Lozada in October 2003.

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London that will start up in 2005. Two additional plants proposed for Milford Haven would add 22 mta of capacity by 2007.

The United States imported 4.8 mta of LNG in 2002, a volume that is expected to double in 2003 as all four terminals on the mainland are in full operation. As demand outstrips domestic production, LNG's share is projected to rise from 5% of all US gas imports in 2002 to nearly 40% by 2010, or some 58 billion cubic metres (42 million tonnes). The US Department of Energy's Energy Information Administration (EIA) forecasts that expansions of the existing plants will account for 60% of the supply; the rest will be imported through four new terminals built on the Atlantic and Gulf Coasts between 2007 and 2010. Small terminals also operate in Puerto Rico and the Dominican Republic where they fuel powerplants. Jamaica, Brazil, the Bahamas, Canada and especially Mexico, where nearly a dozen projects have been proposed, are also potential importers of LNG.

● **LNG costs**

A factor driving the LNG industry is the steady reduction of costs at all links of the LNG chain. The past decade has seen a 35-50% reduction in plant costs from more than \$500/tonne of annual liquefaction capacity to less than \$200 for trains added to existing plants. Major economies of scale have been achieved by increasing the size of liquefaction trains from 1-2 mta in the 1970s to 4-5 mta today and even larger trains are on the horizon. Other factors driving costs downward are the reduction of over-design margins, larger and fewer storage tanks, improved technology and improved engineering techniques.

Shipping costs have also steadily declined from a peak of \$280 million for a tanker with a capacity of 135,000 cubic metres in the mid-1990s to \$150-\$160 million today, thanks in part to enhanced competition. Eight shipyards currently build LNG tankers, but India, China and Poland

are looking at developing construction capabilities. Tankers with a capacity as much as 200,000 cubic metres are under study.

● **Changing market conditions**

LNG contracts are moving away from long-term (20-25-year) agreements with rigid take-or-pay provision to shorter, more flexible arrangements. Increasingly shipping has become the responsibility of the buyer, not the seller. LNG sellers have been offering more favourable terms, including lower prices, to new importers China and India. There is also a movement to eliminate destination clauses from contracts. Over the next decade contracts covering the sale of nearly 30 mta will come up for renewal in Asia, which could incorporate these and other new features. In addition, buyers are increasingly getting involved in downstream activities, while sellers are actively building or acquiring capacity in terminals, especially in the US.

These changing conditions, the existence of surplus production capacity at many plants, growing market demand and the availability of shipping have led to the emergence of short-term and spot sales. These have grown from nearly zero before 1990 to 8% of all LNG volumes in 2002 and could, some analysts predict, account for 15-20% of imports in a decade. Although there is no single world price for LNG, the expanding spot trade has meant greater influence of US prices. Whether LNG will ever become a true commodity is a matter of debate.

Colleen Taylor Sen is Senior Advisor, LNG at the Gas Technology Institute (GTI), Des Plaines, Illinois, USA; e-mail: colleen.sen@gastechnology.org. This article uses information from the World LNG Source Book, which is published every two years by the GTI (www.gastechnology.org) and will be published again in early 2004. A history of the LNG Conferences was published in Seven Decades with IGU pp48-54).

GAS STORAGE UNDERGROUND

NCC is one of the leading construction and property development companies in the Nordic region of Europe. The Group has annual sales of approximately 5 billion USD. Outside of the Nordic region NCC concentrates on the development of infrastructure projects, with emphasis on those with a below ground content, in selected markets.

NCC has been an active participant in the research and development related to the underground storage of hydrocarbons since the 1960's. The advantages of using underground caverns for the storage of hydrocarbons are considerable and include use of land, life cycle costs and safety.

NCC has been responsible for the execution of many such projects over the years and is regarded as one of the world's major players in the field of the underground storage of LPG, both in pressurized and refrigerated form. Based on our research and from experience gained in constructing underground storage facilities NCC has developed the concept for, and is actively promoting, the underground storage of natural gas.

Recently completed gas storage related projects include the underground pressurized LPG storage

facility in Ningbo, China, with BP as Client and the first underground pressurized natural gas project in Kvibbille, Sweden. Ongoing projects include the natural gas storage facility for Statoil in northern Norway.

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EXPECT A BIT MORE



Gas to Power: The Global Perspective

By Dick de Jong

The Presidency of IGU has selected Gas to Power as one of the three projects for special focus during this Triennium. This is not surprising as the growth prospects for gas are largely based on future power generation.

It is less than 30 years ago that the European Union decided to issue a directive to ban all gas for power generation. Gas was considered to be a "noble" fuel that should be used only for premium types of applications. Much has changed since those days: today gas-fired power generation is regarded as a rational, and often preferred option, mostly due to the abundance of gas found after this date as well as to the advancement of technology.

Projections made by the International Energy Agency (IEA) in the *World Energy Outlook 2002* suggest a healthy growth in global demand for gas from 2300 million tonnes oil equivalent (MTOE) today to 4300 MTOE by 2030. While the power industry is already our largest customer group in volume terms, it will feature even more prominently in future: most of the growth for gas is projected to

be in power generation. The other sectors only show a very modest increase in demand.

Homing in on that power segment we see that its gas demand is indicated to grow by roughly 1000 bcm over the next 20 years. Given a total projected global growth in gas demand of around 1600 bcm, this means that over 60% of the growth of the gas market is going to power generation.

So altogether, the future gas to power interface represents an increasingly important feature for the gas industry. How does this perspective look from the point of view of the power industry?

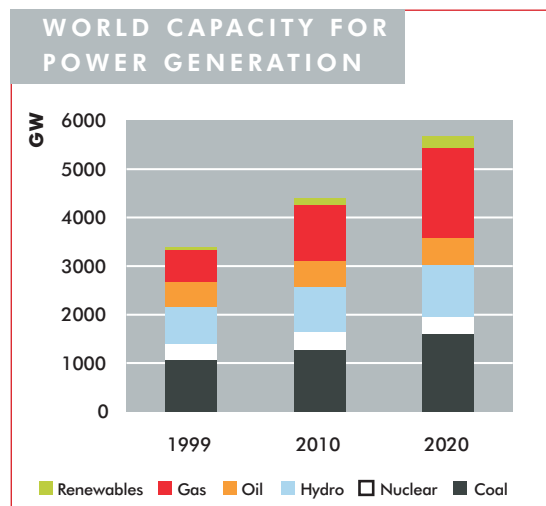
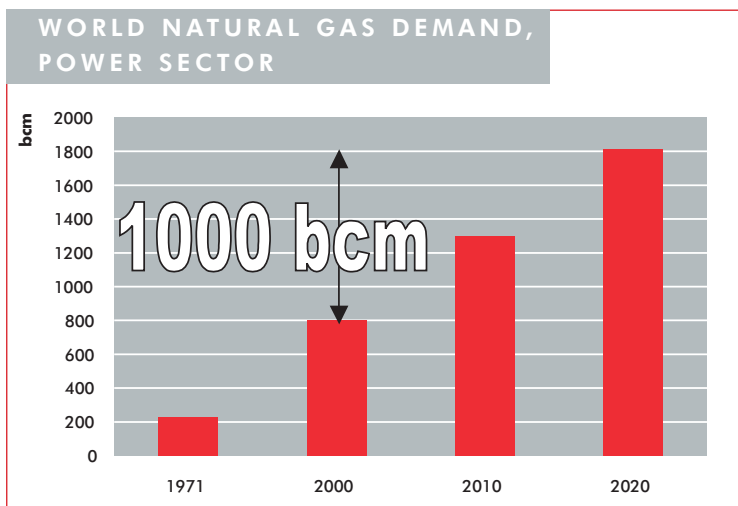
The same projections from the IEA suggest that on a global basis total power generation capacity is set to rise by over 2000 gigawatts. In that context the share of gas-fired power generation rises from around 20% now to some 30% in 2020.

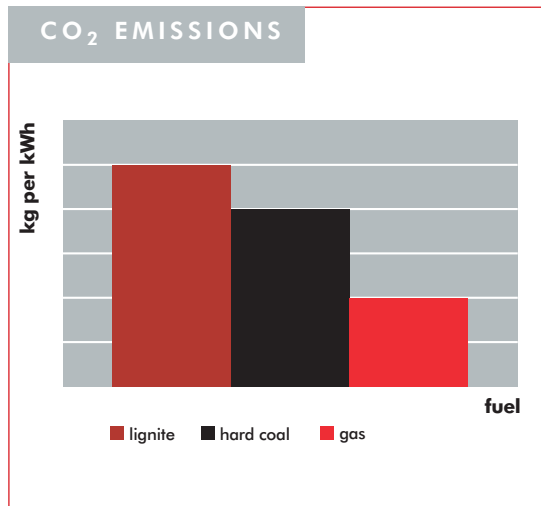
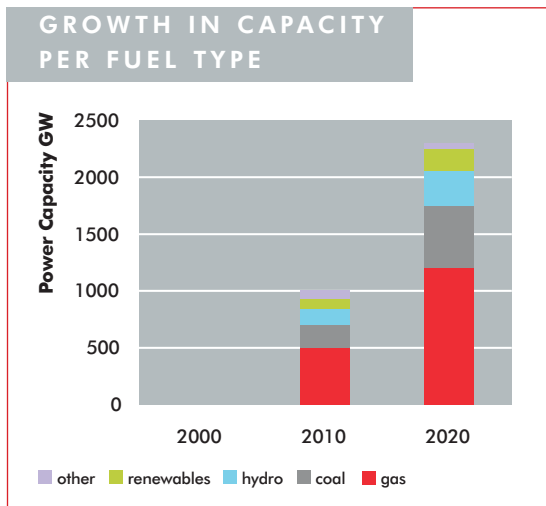
Such a future share of 30% is not dramatic, but looking at the incremental growth alone, the impact becomes far more meaningful. It shows that gas is going to carry the lion's share of all the growth of power generation over the next 20 years. More than 50% of total new capacity will be gas-fired according to the IEA projections. Or, if we leave out hydro and renewable energy, 75% of all new fossil fuel plants will be gas fired.

From an analytical point of view this is not altogether surprising: after all the growth

BELOW LEFT
Figure 1.

BELOW RIGHT
Figure 2.





FAR LEFT Figure 3.

LEFT Figure 4.

engine for gas is running on two competitive cylinders.

First the economic one: according to most economic computations gas-fired power generation is the lowest cost option for new base load capacity in most countries.

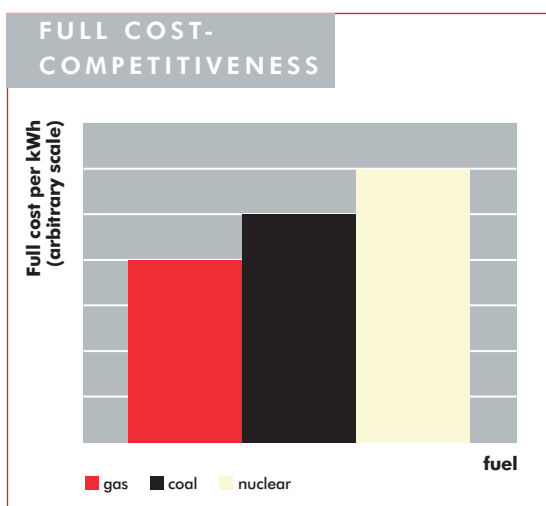
Secondly there is the environmental impact: using new combined-cycle technology gas offers the lowest CO₂ emissions of all the fossil fuels.

● Regional analyses

Thus it is no wonder that the forward projections made by parties like the IEA and the European

Union regard gas as the fuel of choice for power generation in nearly every part of the world. This is confirmed by the regional analysis of the IEA report.

The US takes the lion's share of 280 bcm for power generation, which represents 70% of the total expected electricity market growth. Europe needs 200 bcm and virtually all of new power generation capacity is expected to be gas-fired. But also South America and Africa show a respectable growth and an equally respectable demand for gas; 60% of their total generating capacity is here earmarked for gas.



GROWTH OF GAS FOR POWER IN NUMBERS

	Gas for Power (bcm)	Gas as % of total power growth
North America	+280	70
Europe	+200	~100
South America	+70	60
Africa	+80	60
Developing countries	+370	30
Total world	+1000	60

FAR LEFT Figure 5.

LEFT Table 1.



Developing countries together have a need for 370 bcm for new gas fired power generation. Here the gas share is only 30% and that is mainly due to the expectation of the IEA that China in particular will continue to rely on coal for most of its new generation capacity.

● **Making the growth possible**

As we have seen, for both the gas and the power industry the one is the main contributor to the growth of the other. This mutual dependence is all the more critical because the volumes and the associated investments are staggering for both industries, making the impact on the businesses considerable.

Given the stakes and the implications for the businesses, it is only prudent to take a more critical look at the projections. Questions that need to be answered include:

- How realistic are these projections of growth?
- Do the power industry and governments share the view on future demand and the role for gas?
- Is there a common vision on the processes and business environment necessary to achieve the required growth of gas-fired power generation?

The IGU project is based on the premise that, if the power and the gas industry are meant to realise the growth as assessed in the IEA Outlook,

they must be working closely together. So, as a gas industry we need to understand how the power industry views the future:

- What are their growth projections?
- Do they see gas as the preferred fuel?
- Do they see obstacles or problems in bringing the growth about?

● **Concerns and reservations**

Undoubtedly power generators may have concerns and reservations about future gas-fired generation. Without putting ourselves in their shoes, we could already tick off a few.

Firstly, gas price issues will always feature prominently. One of these issues could be described as the “merit order paradox”: assuming that the gas price is such that it makes gas the lowest full cost option for new base-load generating capacity (see Figure 5), it may still have the highest marginal costs relative to the other options, and relative to the capacity operating in the market (see Figure 6).

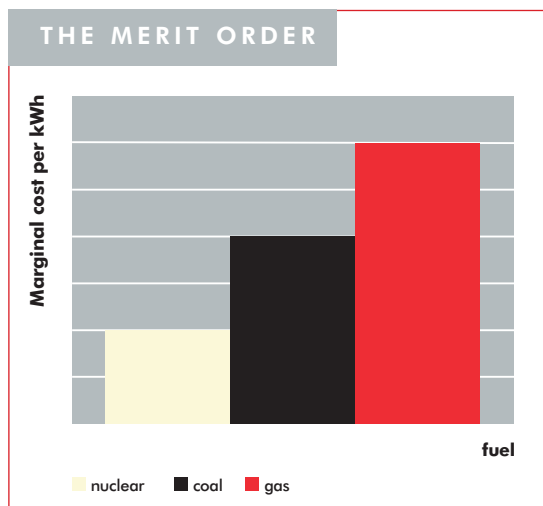
So, once the plant has been built, it is most sensitive to fluctuating demand and may not perform as a base load plant. Consequently a gas-fired plant is very vulnerable to changing demand and this, in turn, may have consequences for economic performance and for contractual arrangements.

Price uncertainty is another potential concern. Gas prices have risen considerably over the last few years, while in the US market there has been particular volatility. This is not necessarily helpful for our industry. It makes our customers nervous. It will also be a concern for power generators with regards to new investments: higher gas prices affect the competitiveness of gas. Even uncertainty about future gas prices impacts the choice of fuel.

Both in the US and in Europe gas prices tend to show a strong correlation with oil. But to the power generator, oil is not necessarily the competitive choice.

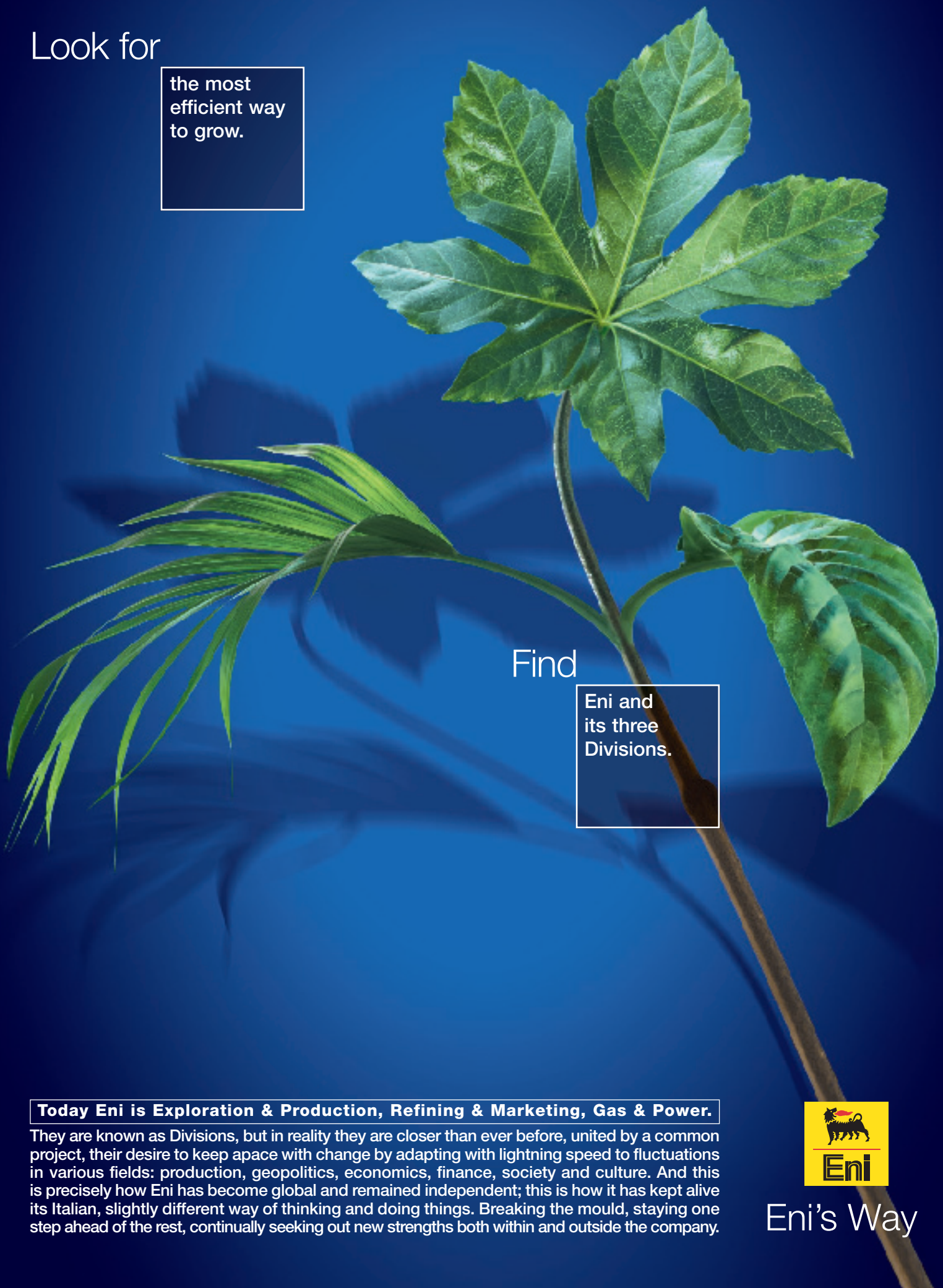
Secondly, previous experience with gas or gas negotiations could influence the choice of power

RIGHT
Figure 6.



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Eni's Way



generators. We have recently seen the boom-bust type of development with the “dash for gas” in the UK and US markets where many gas-fired power plants were built. Today, many of them are struggling to remain economic.

Thirdly, transparency could be a concern. The gas market does not function like the oil or coal market. It is not always easy to get a competitive bid for gas supplies in every part of the world. Consequently pricing and market conditions are less transparent than for other fuels.

Finally, the size and the complexity of putting together a gas supply chain is at times daunting. It is complex to bring all the elements of the gas chain together. It may require longer-term contractual commitments than the power generator prefers to make. It could affect the desired level of supply flexibility. And sometimes, even after all of that is done, the economics of the investments in the supply chain require additional market demand to build up the necessary volume throughput, higher than what the power generator needs.

● **Governments also have a role to play**

These are a few examples of what could be concerns on the side of power generators. But a successful development of the level of gas-fired generation needed by power generators does not only depend on the two industries. Governments also need to make an important contribution. In the very first place they need to agree with the power industry on gas as the fuel of choice and on the desired growth of gas-fired power generation. Without a clear political will there could be numerous obstacles to such growth. On that basis governments will have to provide the conditions necessary to develop the business. It involves setting up an appropriate regulatory environment and dealing satisfactorily with any concerns that may exist over security of gas supply. In a number of developing countries it may also involve finding solutions to reconcile subsidised domestic electricity prices with the realities of prices for internationally

traded gas and the costs of new investments in infrastructure.

Can the gas industry deliver? The last question that we should ask ourselves is whether we, as the gas industry, can pull it off. There are big challenges for the gas industry to bring an additional 1000 bcm for power generation to the market by 2020. We should not forget that this is part of a total incremental demand of 1600 bcm. To put 1000 bcm into perspective: it represents 40 pipelines out of Russia into Europe (i.e. an average of two pipelines per year), or 150 LNG terminals (on average seven terminals per year). And that is quite a challenge, not only for the developing markets but also for the so-called mature markets. In the US we see what gas prices will do if too little gas comes too late into the market. The prices may well rise to a point where the competitiveness of our business is jeopardised.

● **It takes three to tango**

The upshot is that none of these three parties, the power industry, the gas industry and governments, can make this projected future development happen on its own. If we want to get anywhere near this formidable growth it can only be done by the fullest cooperation among the gas industry, the power industry and governments.

An example of such cooperation is the West African gas pipeline. This project will connect four countries by an offshore pipeline, from Nigeria to Ghana, via Benin and Togo. It involves 600 kilometres of pipeline costing approximately \$500 million to construct. The volume is not going to make world news – it will be 1.2 bcm per annum to start with – but it has significant growth potential. Moreover, the efforts to bring this about are no less impressive and illustrate all of the points stated above.

The driver for this project is power generation. A power station in Ghana will be converted from oil firing to gas firing and it will take virtually all of the initial volumes. Four governments have been

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cooperating to make this happen. It has resulted in a treaty with a comprehensive legal, fiscal and regulatory framework and an international project agreement. All together it has been a long, complex process that started around the middle of the 1990s. International institutions have made another important contribution. The US Agency for International Development and the World Bank both contributed not only in terms of credit support, but also by offering a neutral platform on which the legal, fiscal and regulatory framework could be built.

More work will be needed to bring this to a final investment decision, which is planned by late 2004. It has been a difficult process but the rewards will be considerable. The gasification of Ghana, Benin and Togo will do more than just allow for new gas-fired power generation. It will result in energy savings in those countries, will have a positive effect on employment and will be a stimulus for economic growth. We shall follow this example with great interest.

● The big challenge

The potential is there, but what if we cannot achieve it? First there would be a big loss of opportunity for our gas business to create new markets and growth, which goes beyond the power stations. We have already mentioned the example of the West African gas pipeline project. Power stations are needed to make the initial investments, but from that follow the spillover into other investments and gradual growth of other premium markets.

Moreover, without new power generation capacity or with a delay in the development of new power generation, the creation of wealth would be delayed. Another IEA report establishes a direct link between poverty and electrification. However, the effect of failure to develop the gas option is not always as extreme as that: in many cases it may result in a decision to develop coal-fired generation instead. Apart from the longer duration of the construction of a coal-fired power station, there is

an environmental consequence: an immediate impact on emissions. Assuming the prospect of 1000 bcm is realistic, then if that target is missed by 100 bcm and coal-firing is used instead, the world is going to see an additional 250,000 tonnes of CO₂ going up into the atmosphere.

● Strengthen the gas-power interface

The objective of this special project is to create a dialogue with the power industry and with governments in order to achieve a common understanding of growth projections for gas-fired power generating capacity, to identify the enabling instruments and to address, where necessary, any obstacles for such development, so that we can jointly realise its full potential. In the process our efforts will include and take into account of changing financing and risk structures and changes to both our industries. We will be interested in reviewing the future role of independent power producers (IPPs) and of distributed power and in assessing the outlook for gas and power convergence.

This dialogue with these two other parties, the power industry and the governments, should not only help us to get better insights into this business segment, but also to get the other stakeholders to recognise that success of its growth depends on full cooperation among all three parties. In doing so we will give particular attention to the prospects for enabling regulation and making a contribution to sustainability. The outcome will not be a magic wand that can be waved to create solutions. But if we can create an environment in which the opportunities and the hurdles can be addressed in an open and constructive dialogue, our industry will have made a meaningful contribution to a better future.

Dick de Jong is a Fellow of the Clingendael International Energy Programme. He originally presented this paper to the IGU Council Meeting in Cape Town, South Africa, on October 29, 2003.

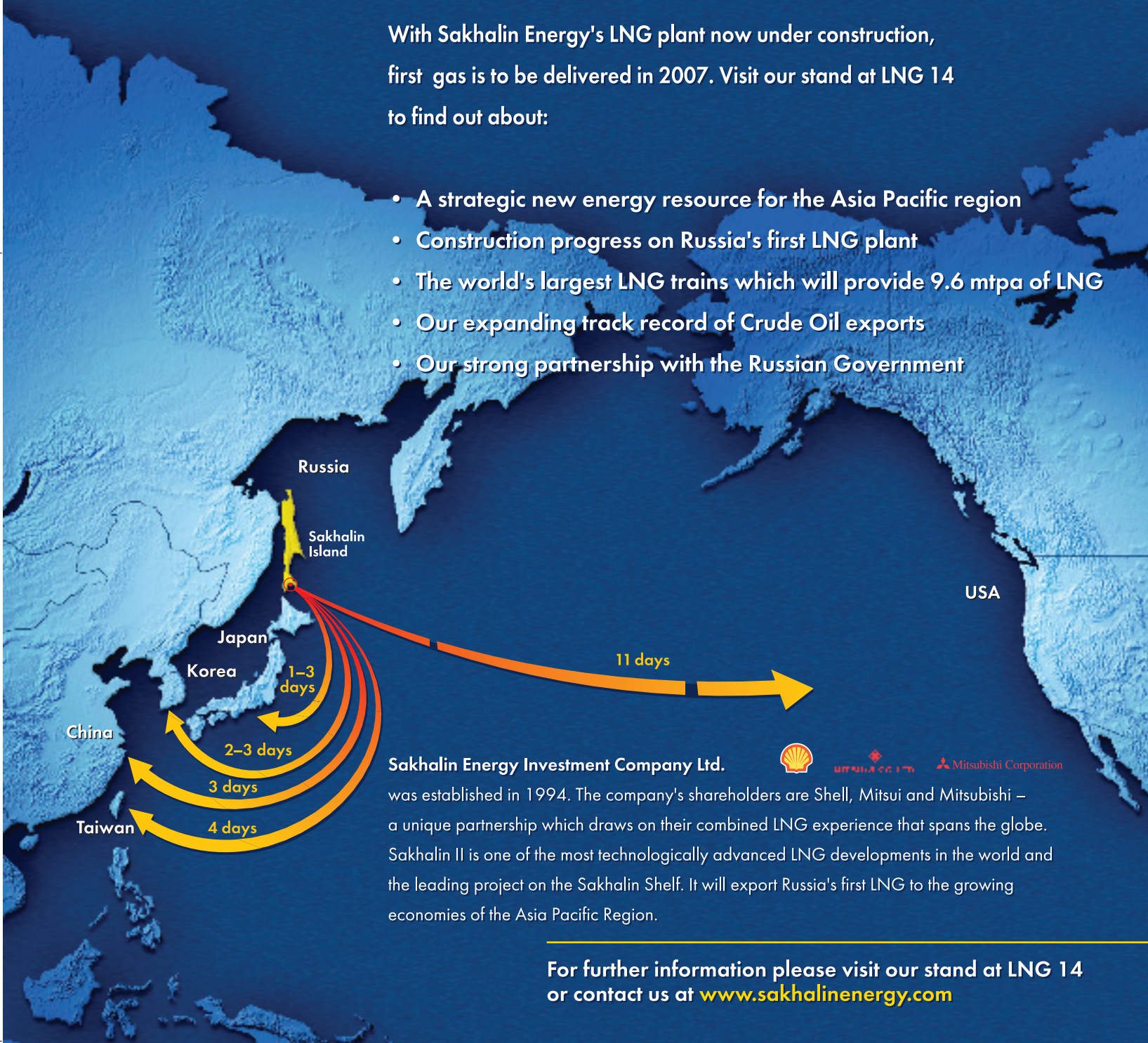


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Enron's Ghost Still Haunts the Energy Industry

By Terence H. Thorn

With operations in 20 countries, Enron Corp. set out in the early 1990s to become an international energy trailblazer, with grandiose projects in countries where no other company would go. Today, the thousands of Enron employees who have lost their jobs, the thousands more who have lost their retirement funds and the shareholders who feel plundered, are struggling to understand how a firm that once had a market capitalisation of \$100 billion and was the six-time consecutive winner of *Forbe's* most innovative company in



Kenneth Lay, former Chairman and CEO of Enron, is one of many of the company's executives facing lawsuits.

America award could disappear into bankruptcy in a matter of months.

Enron filed for bankruptcy protection on December 2, 2001 owing 24,000 creditors \$66.4 billion. It is still attempting to reorganise, while its senior officers and board face a blizzard of lawsuits and the possibility of civil and criminal convictions. Fees and expenses billed to Enron by its law firms, accountants and other consultants already exceed \$575 million, and by the company's own reckoning the legal and accounting costs of its bankruptcy will exceed \$1 billion in 2006. That is more than any company has ever spent confirming a Chapter 11 bankruptcy plan. With the third and hopefully final reorganisation plan set for filing in early 2004, Enron may emerge later in the year as two new companies formed from its remaining domestic and international assets respectively. Its name will disappear but not its legacy, both good and bad.

Enron's flight into the bankruptcy court has sparked the most sweeping business reforms since the Great Depression of the 1930s. Events in 2002 became the defining image of US business with senior executives led in handcuffs from the courts and displayed in front of the world's television cameras as a warning to other white-collar criminals. It was a year when once untouchable companies collapsed at an unprecedented rate. Five of the top 10 bankruptcies in US history occurred during 2002. The collapses have led to a period of deep introspection on the nature of capitalism in the US. Curbs on excessive pay have become a key theme, as has tightening the rules on corporate governance.

● US energy companies hit the hardest

Prior to Enron's bankruptcy, equity markets overall had been down three years running and for energy companies stakes had been high because of the proliferation of investigations and lawsuits focused on the trading companies and their executives. The trend started with the implosion of the California



energy market in 2000, which triggered a wave of federal and state lawsuits and investigations. Then in late 2001 Enron collapsed amid allegations of accounting irregularities and possible fraud, which was followed by another round of inquiries this time involving the US Securities and Exchange Commission (SEC) and the US Department of Justice. Enron became one of a long list of companies that had badly damaged investor confidence in financial statements by manipulating their accounting, more or less at will, with the aim of protecting and inflating profits and hiding losses. Finally, in 2002 allegations that the energy trading companies had artificially inflated their trading volumes by selling power back and forth among themselves at the same price broadened the inquiries.

In 2000 companies like Mirant, Calpine, Aquila, Dynegy and Williams traded at 10 and 20 times their current stock prices as energy investors bet that the merchant energy sector led by Enron would continue its strong growth. After the trading revelations, the impact on any company associated with energy trading was devastating.

Investors were deterred by the weak business fundamentals and the continuing scandals and regulatory and criminal probes. Already hammered by falling energy prices, the collapse of energy trading, credit down grades and the accounting scandals, energy companies faced the taunting task of financing or refinancing debt at a time when banks had soured on the industry.

● **The California energy crisis**

The highly publicised shortage of electric power in California during the summer of 2000 was alleged to demonstrate that deregulation of electricity has gone too far. But it mainly demonstrated that badly designed partial deregulation may be worse than doing nothing. Unfortunately, a series of memos uncovered during the investigation of the shortage showed how Enron and other companies were able legally to game this flawed system to boost profits.

This was unfortunate because it allowed the politicians and regulators to move the spotlight from themselves to Enron. The internal memos showed that Enron's traders used 10 different techniques to, among other things, create phantom congestion on California's power transmission grid to get congestion payments, sell power out of California at the price cap and sell it back the next day at uncapped prices (ricochet or megawatt laundering), and submit exaggerated load schedules, all at a time when California was scrambling to keep the lights on.

The disclosure of its speculative trading practices showed Enron made hugely profitable bets – including one that resulted in a \$485 million gain on a single day in December 2000 – at a time when federal and state investigators say the company was conspiring with other energy trading companies to manipulate power and natural gas prices in the West. That tally included days with immense trading losses, including a \$550 million reversal just a week after the \$485 million gain. In the two years before filing for bankruptcy protection on December 2, Enron made about \$1.8 billion in profits trading electricity in California and other Western states with profits exceeding \$20 million on many single days. Until a few weeks of its bankruptcy, Enron was the undisputed trading leader, with a dominant 33.05% share of the physical settlements of gas and power, amongst the top 10 players. The next five players, including American Electric Power and Dynegy, together constituted a mere 42.03% of the physical settlements of gas and power.

The investigation by the Federal Energy Regulatory Commission (FERC) has also found that the common method for reporting prices for natural gas and electricity trades – surveys published by industry publications – did not use statistically valid procedures and was subject to manipulation by traders who have an incentive to report false data to benefit their own trading positions. The FERC report did assign some blame



to the state, noting that shortages of electricity and underlying problems with the structure of the marketplace created an environment in which prices could be driven up.

Federal and state regulators immediately began exerting more oversight on traders and demanded increased disclosure. The Justice Department joined other federal agencies in investigating allegations that Enron manipulated California's power market two years ago. A capital-restrained industry plagued by regulatory uncertainty found it harder to get money to build power plants and pipelines paving the way for future energy shortages. The road to broad deregulation of the power markets was blocked or dramatically slowed down. The possibility of tens of millions of dollars in refunds by companies operating in California further depressed stock prices.

● The spotlight on energy traders

The collapse of Enron not only changed the perception of public shareholders and peers of the energy marketing and trading business, it forever altered the way financial analysts will evaluate and auditors will scrutinise not only the ability of similar operations to value and report on their businesses, but also of any energy company whether associated with trading or not. The tiniest doubts about a company's accounting or trading practices was enough to trigger a collapse in share price. An SEC investigation was the kiss of death.

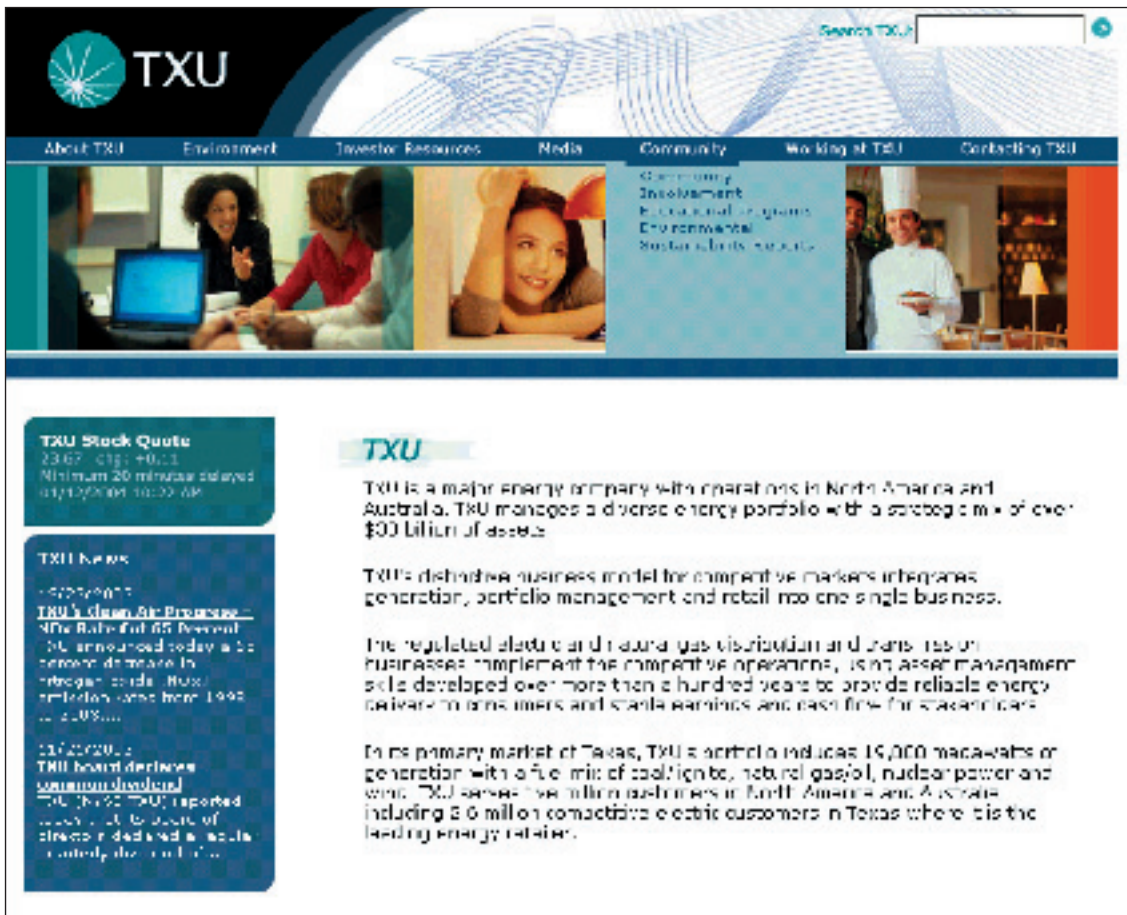
Prior to the Enron collapse, wholesale trading operations had been dominated by complex trading operations requiring sophisticated front and mid-office systems for trading and risk management. The aftermath of Enron, Dynegy and others created a new apprehension about counterparty risks and whether systems can adequately track and manage those risks. The number of energy traders has plummeted and energy trading has dwindled radically as the creditworthiness of the trading companies has been severely eroded. Once the Enron scandal broke,

credit rating agencies took a much harder look at Enron's former rivals and judged that for most of them, debt loads were too high, cash flow too low and their accounting too inscrutable.

Companies maintained that the trading business, the buying and selling of electricity and gas, had been unjustly tainted by the Enron scandal. Others saw the power trading companies as corporations with heavy debt burdens and weak cash flows, producing big profits on paper but with little real revenue from their 10-to-20-year energy contracts.

The latter perception prevailed as credit rating agencies quickly lowered the debt ratings of many energy companies leaving many hovering at levels that were barely or below investment grade. No longer able to tap the commercial paper market and forced to draw down their unsecured lines of credit, energy marketers faced a liquidity squeeze as they used available cash to reduce their debts. To survive, companies pared their trading units, once the engines of earnings growth, and sold assets in a rush to convince investors that they were not the next Enron. The focus was to conserve capital and increase liquidity. Of the 14 leading US gas marketers in 1999, only five are actively trading today.

The longer-term market for energy trading has essentially dried up, because with credit ratings so low, companies would have to put up sizeable collateral to conduct long-term trades. They cannot do the one, two and four-year deals because they cannot find counterparties. In their much happier recent past, energy traders could execute such long-term deals and book the profits from them immediately under mark-to-market accounting. The problem was that no one really knew the prices for power so far in the future, so the profits calculated for the contracts were based on models the traders themselves devised. The more recent disclosures of "wash" or "roundtrip" trades – essentially trading with yourself to give the appearance of inflated revenues – further damaged the credibility of the energy companies. Due to low credit ratings, even



TXU is one of the surviving active gas marketers.

entering into long-term gas supply contracts became difficult, a serious problem in times of increasing price volatility.

● Enron's legacy

Enron's ultimate demise was due to a failed business strategy that over invested in new markets that its executives did not understand. A corrupt financial strategy that covered up debt, hid major losses and lined the pockets of senior management was an attempt to cover up these failures. Ironically the equity markets had seen through the accounting manipulations long before the regulators. Alarmed at Enron's huge negative cash flow, the stock price dropped 40% in the eight months before bankruptcy.

Enron and subsequent events have led to some of the most sweeping set of reforms to hit US capital markets since the SEC was established in the 1930s. With Enron, all the elements of the corporate model designed to ensure that bad accounting is rooted out did not work. There was weak corporate governance and a failure of internal and external auditors, while the latter were conflicted in providing high-quality audits of the financial statements by having more lucrative consulting arrangements with the same clients.

Another reason Enron has such a dramatic impact on markets and institutions was that about every element of the US financial reporting infrastructure – the elements which are designed to ensure the quality of financial reporting and instil



confidence in the markets – did not work very well. Regulators (the SEC) did not review Enron's filings for three years (in part due to the strain of reviewing all of the dot-com initial public offerings in the late 1990s), accounting standards in this area were deficient and Wall Street research analysts apparently made buy recommendations on stocks such as Enron, in exchange for investment banking business.

The downstream energy companies in the US were hardest hit and the focus in the past two years has been on restoring the public image, defusing balance sheet scrutiny and credit problems, paring debt and curbing their trading operations. The era of fast growth, high stock multiples and plenty of credit is over and has been replaced by an era of strong balance sheets and greater transparency in explaining how profits are made. Gone are the days when investment grade assets could be combined with volatile energy trading units for the whole to be presented as an investment grade company. Companies now need to have a first class credit rating and improved accounting and disclosure requirements.

The good news is that the industry has begun to recover. The strong emphasis on transparent business models, solid assets and a reliable, growing customer base is restoring investor confidence. It has been back to basics. Flashy stocks with exotic business models are out. Income and stability is in.

It is a solid story. Projected increase in natural gas demand of nearly 2% per year for the next 25 years translates into earnings growth from energy utilities' core businesses. Total shareholder return for energy utilities delivering natural gas is very competitive in today's capital markets – estimated earnings growth of 3% to 5%, plus an average dividend yield of 5%, results in a total return of 8% to 10%. Dividends always have been key to energy utilities with payout ratios averaging 65%. Many companies have paid dividends continuously for over 50 years.

Issues remain including the liquidity of markets and the need to stem price volatility, and the difficulty in raising capital is an especially daunting challenge given the crucial need to build new pipeline infrastructure between now and 2030. To meet projected demand the transmission pipeline network will have to increase by 15% (61,000 kilometres) and the distribution network by 27% (410,000 kilometres).

● A final word about Enron

It should not be forgotten that Enron was a major driving force in an effort throughout the US to restructure regulation of wholesale and retail energy markets. The key element of the model was the creation of wholesale spot markets under federal, not state, control. Once the spot markets were established, Enron offered respite from the price volatility and was able to hedge energy prices either through contracts or energy market derivatives that would protect wholesale buyers. Enron will be remembered for its leading of the fight for competition.

In short, Enron created markets where none existed and thereby lowered the cost of energy for customers and businesses. Indeed, many of Enron's corporate financing innovations have been adopted by most global energy market participants.

A larger question is whether the public can have confidence that federally-approved wholesale markets and market-based rates are free from strategic bidding, gaming or manipulation. Market-based rates established in or influenced by federally approved spot markets must yield results as good or better than traditional cost based regulation to satisfy the existing statutory command to establish reasonable rates.

Terence H. Thorn was the Chairman of IGU Working Committee 9 in the 2000-2003 Triennium and is President of JKM Consulting in Houston, Texas. He may be contacted at tthorn@txthorns.net.



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SEGAS, a company owned by UNION FENOSA GAS, which is 50 % Eni and 50 % UNION FENOSA, is constructing an LNG plant in the free zone area of Damietta Port. The 35 months schedule of the project commenced on the 26th of November, 2001. On December 2003, after approximately 26 months progress, the project is 80 % complete. The LNG production is expected in November 2004

Damietta LNG plant is the first LNG plant built in Egypt and it will be the first exporter of LNG to Europe and other markets, making Egypt to join the LNG exporters club and setting a new milestone in Egypt's energy business. The plant location at Damietta Port on the Mediterranean is a very strategic position which gives potential access to all the LNG markets.



The LNG plant of SEGAS is the biggest capacity train in the world to date and it is designed to produce 4,8 million tonnes per annum. The technology used is propane pre-cooled mixed refrigerant liquefaction process (APCI).

The plan is to complete all utilities start up by July 2004 after which process train units will be commissioned one after the other, up to November 2004, when the train begins to produce LNG, in order to export the First Cargo by December 2004.



The project represents an important boost to Egypt's economy as it will generate significant currency hard revenues for the Country. The project construction work force is around 6000 people, 97 % of which are local resources.

Safety records of the project are highly commended as its results are setting a world class performance standard.

WAY FORWARD

January 2004	Jetty completion
June 2004	Liquefaction train completion
July 2004	Mechanical assembly completion
August 2004	Storage tanks completion
September 2004	Process train pre-commissioning/commissioning
November 2004	Start-up
December 2004	Export the first LNG cargo
January 2005	Plant fully operating

Egypt's First LNG Plant

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12211 Giza / Cairo, Egypt
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SEGAS (Damietta Office)
LNG Project, Damietta Port
Damietta, Egypt
Tel +2(057) 291 042
Fax +2(057) 291 052



Belgrade Conference to Foster Gas Development in Transition Economies

By Mark Blacklock

In its vision statement IGU recognises that natural gas has an important part to play in satisfying the global need for an environment-friendly energy source. This is particularly relevant for countries that are heavily reliant on coal like those in southern and eastern Europe, so when the Gas Association of Serbia and Montenegro floated the idea of turning its annual conference into an international event IGU was quick to offer assistance.

"IGU has played a valuable role in helping us to plan and promote the conference," declares the Association's General Secretary Dr Vojislav Vuletić, who is also Assistant Manager of NIS-Energogas, a division of the Petroleum Industry of Serbia (Naftna Industrija Srbije – NIS).

The Association's aim was to bring together countries in southern and eastern Europe that are at different stages in the transition to a market economy and countries with developed market economies for all to share experiences about the development of their gas industries. Dr Vuletić took the opportunity of raising the issue with IGU Secretary General Peter Storm while both were attending a meeting of regional gas associations in Sarajevo, Bosnia and Herzegovina, in October 2002. Following the initial discussions, the IGU Secretariat worked with the Association to develop an agenda of discussion topics and draw up a list of potential keynote speakers, and an international programme committee was set up with representatives from all the IGU Charter Members in the region. IGU also agreed to help promote the conference and to fund three awards for the best papers submitted by younger authors below the age of 35. All was ready to make the first announcement for the "International Conference on Development in the Gas Industry of South and East European Countries in



Trials are underway in Belgrade with this CNG-fuelled IK 104.



Transition" at the 22nd WGC in Tokyo in June 2003.

The conference will be held between June 13 and 17 in Belgrade at the Hotel Jugoslavija and the event is being organised by BBN Congress Management, which has worked with the Association for many years. There will also be an associated exhibition and a programme of technical and social visits.

The agenda covers seven subject areas (see box) and according to Dr Vuletić the most important issue is the harmonisation of legislation and technical standards for gas supply and utilisation. This is a major challenge for the transition countries and he hopes that the conference will reinforce and advance work in this area being carried out by the regional gas associations and their counterparts in western Europe. Among the latter he singles out the German Technical and Scientific Association for Gas and Water (DVGW) as being especially helpful.

The second key issue is transportation and Dr Vuletić is keen to see further development of the regional gas pipeline network. Currently the Federation of Serbia and Montenegro only has one import pipeline connection with Hungary, which passes through the gas-producing province of Vojvodina and terminates at Niš in Serbia. (A branch off this also supplies Bosnia and Herzegovina with imported gas.) He would like to see an extension east to give a second import connection with Bulgaria and west into Montenegro. Initially the latter would bring in supplies, but in the longer term it could serve as an export route if commercial quantities of gas are found offshore Montenegro's Adriatic coast.

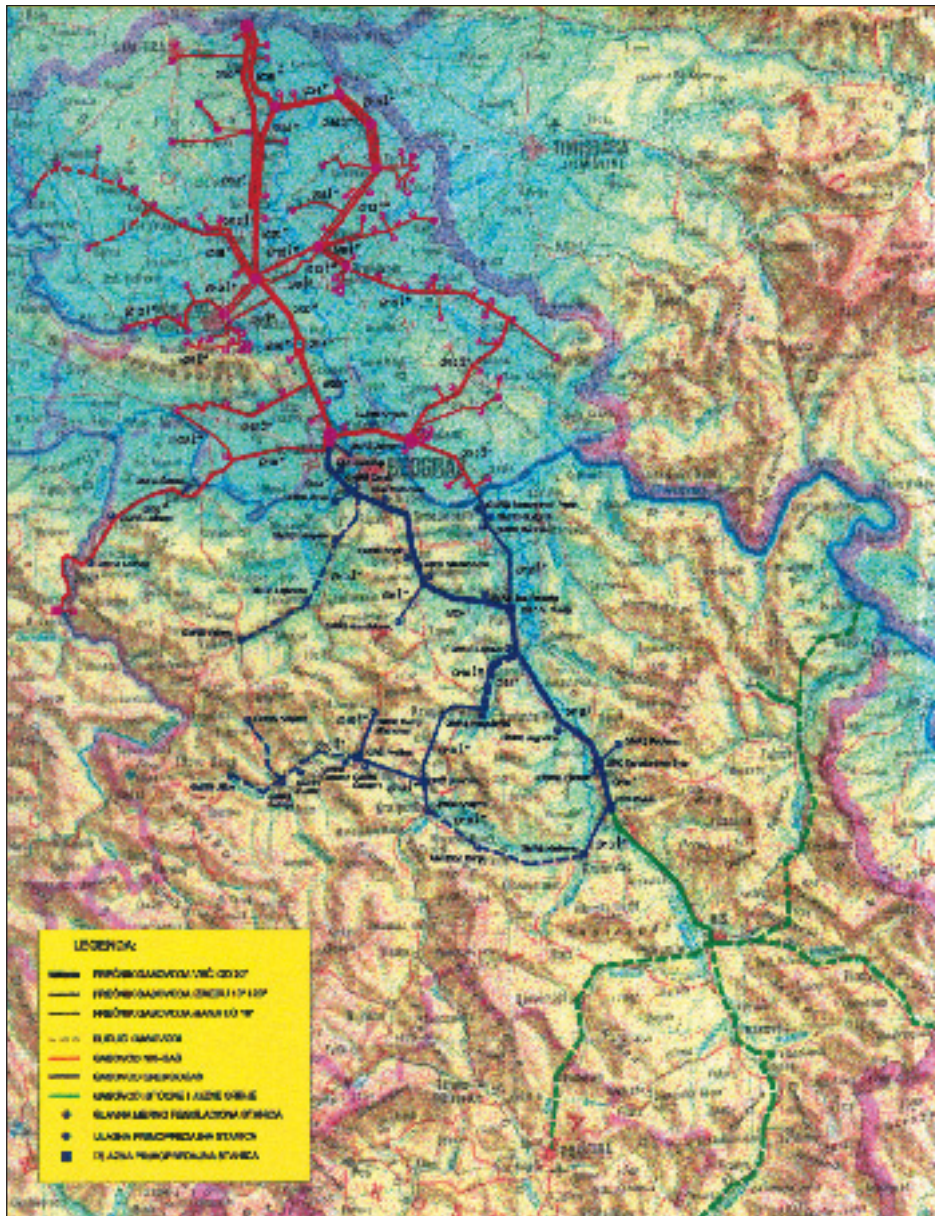
A further long-term project would see Serbia as one of the transit countries for a new international pipeline supplying Iranian gas to western Europe. This was originally proposed prior to the break-up of Yugoslavia and is now back on the agenda following the ending of sanctions against Serbia

CONFERENCE SUBJECT AREAS

- **Gas Industry and Regulations**
Legislation and Technical Regulation in the Gas Industry
- **Supply and Demand**
Directions in Natural Gas Supply and Demand
- **Gas Transportation and Distribution**
Connection of Gas Pipe Systems
- **New Technologies**
New Technologies and Equipment in the Gas Industry
- **Gas and Electricity**
- **Priorities in Development**
Transition and Gas Industry Liberalisation; Price Politics and Gas Industry Economy
- **Strategic Priorities and Conclusion**

and the inauguration of a pipeline from Iran to Turkey in January 2002. Several routes are under evaluation for the extension north from Turkey, one of which includes an undersea section, and the Association is promoting a transit through Serbia as the shorter of the overland options.

The Association also supports the greater use of natural gas vehicles (NGVs). Trials are underway in Belgrade with a CNG-fuelled bus developed by local company Ikarbus and Dr Vuletić says that he would like to see Serbia and Montenegro connected to the proposed Blue Corridor network. This is a project to establish international corridors for NGVs – particularly heavy goods vehicles – by equipping designated motorways with refuelling stations at appropriate intervals. The project was initiated in 2000 by the Vernadsky Foundation and Gazprom and economic and environmental feasibility studies have been carried out for the Moscow-Minsk-Warsaw-Berlin, Moscow-St Petersburg-Helsinki and Berlin-Rome corridors. Funding is now being sought from national governments and international institutions to launch a pilot corridor.



This map of Serbia's gas pipeline system shows the networks of NIS-Gas in red, NIS-Energogas in blue and YugoRosgas in green.

● **National potential**

Moving from the regional to the national level Dr Vuletić sees enormous potential for the development of the gas industry in Serbia and Montenegro. Gas currently accounts for approximately 12% of the country's primary energy consumption with around a quarter of the current

annual consumption of 2.5 billion cubic metres being produced domestically and three-quarters imported from Russia. Coal accounts for 50% of primary energy consumption, oil for 35% and other sources including biomass 3%, and the aim is to raise the gas share to between 20% and 25% by 2010.

Prof. Dr Nenad Djajić, Manager of the University of Belgrade's Centre for Energy in the Faculty of Mining and Geology and Deputy Chairman of the Gas Association's Managing Board, explains that there has been a reduction in industrial gas consumption and that the focus is on increasing domestic use. "Currently 160,000 households use gas and our target is to increase this to more than 500,000 or 17% of households by 2010," he says. The country's gas transmission and distribution system is being developed and an increase in the previously low electricity tariffs will also help make gas more attractive. A further aim, continues Prof.

Djajić, is to increase summer gas consumption by switching to co-generation plants in district heating systems. These are prevalent in Serbia's urban areas and many are gas-fired with a natural consumption peak in winter. Switching to co-generation would allow electricity production in the off-peak summer months and reduce the peak-to-trough ratio.

Responsibility for gas transmission in Serbia is divided among three companies on a regional

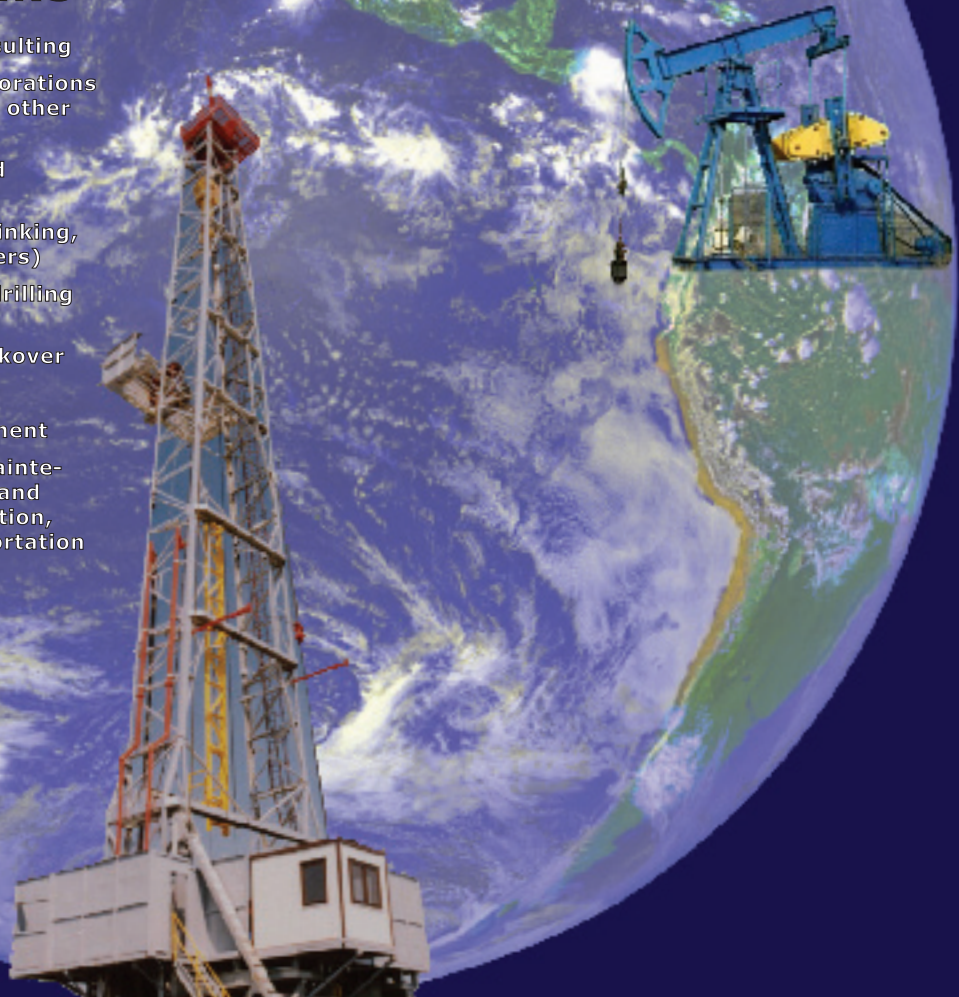
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SCOPE OF WORKS

- *Petroleum engineering and consulting
- *Geological and geophysical explorations of oil and gas, ground waters and other mineral sources
- *Drilling wells for oil and gas and ground waters
- *Utilization of ground waters (drinking, mineral, thermal and healing waters)
- *Special works and services for drilling for oil, gas and ground waters
- *Well testing, unloading and workover
- *Carrying out of capital projects
- *Oil and gas production management
- *Construction, production and maintenance of the production facilities and equipment for oil and gas exploration, production, gathering and transportation
- *Administration and services



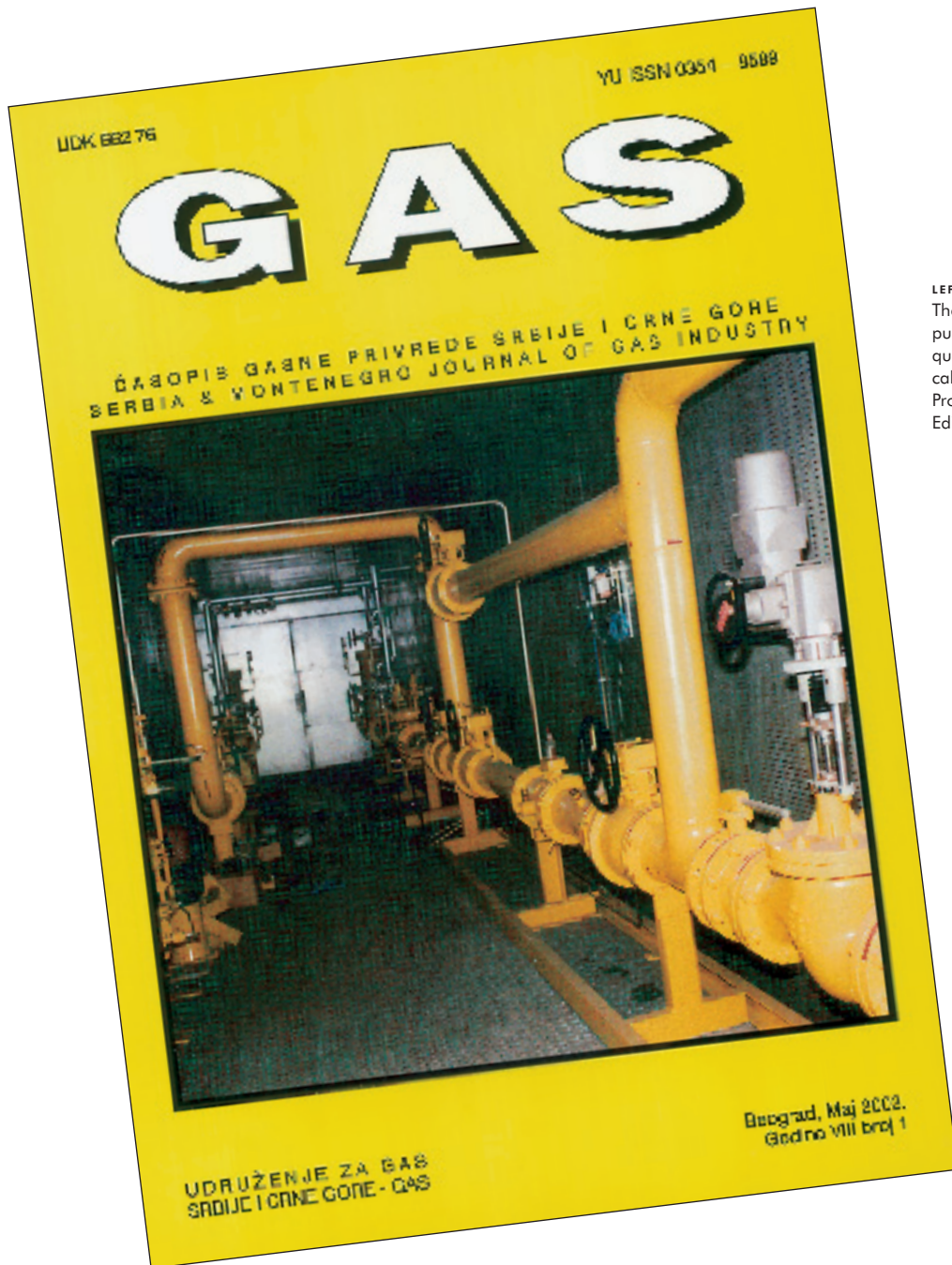
QUALITY POLICY

All departments got quality assurance certificates from:

Yugoslav Certificate and Inspection Organization Evrocert,
Austrian Organization for Quality ÖQS and
International Quality Network IQNET

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LEFT
The Association publishes a quarterly journal called GAS and Prof. Djajić is the Editor-in-Chief.

basis explains Živojin Knežević, Manager of the LPG Division at NIS-Energogas, who was a member of IGU's Working Committee 3 (Liquefied Gases) in the 2000-2003 Triennium. Two NIS subsidiaries, NIS-Gas and NIS-Energogas, operate in the north and centre of Serbia respectively, while YugoRosgas in which Gazprom has a 50% stake has the southern region.

As the map on page 110 shows NIS-Gas has the most developed network and it works with 34 local distributors. NIS-Energogas has a much smaller consumer base and works with one distributor as well as distributing itself, while YugoRosgas is still developing its network having

built the pipeline between Pojata at the edge of the NIS-Energogas region and Niš.

● **Regional development**

The national conferences of the Gas Association of Serbia and Montenegro typically attracted around 300 delegates and the target for the new event is 500. Dr Vuletić and his colleagues hope that it will make a valuable contribution to the development of the gas industries of the transition countries in southern and eastern Europe.

Mark Blacklock is the Editor-in-Chief of International Systems and Communications.

Slovenský plynárenský priemysel, a.s. (SPP)

Slovenský plynárenský priemysel, a.s. (SPP) will be the largest gas transporting company in the European Union from May 1, 2004, with the accession of Slovakia to the EU. SPP provides continuous and uninterrupted supplies of natural gas to both local as well as foreign consumers. SPP sells annually approximately 7 billion m³ of natural gas to more than 1.4 million customers in Slovakia.

Significant changes have taken place in SPP during the recent period. In 2001 the company started its restructuring and the state owned company transformed into a joint stock company, 100% owned by the state. In July 2002 a 49%-stake of the company was privatised. The winning consortium consists of Ruhrgas, Gaz de France and Gazprom. The position of SPP on the international gas market was significantly strengthened through the entry of foreign investors into the company.

SPP is currently going through the process of restructuring. The main objective is to create a modern, transparent and customer-oriented company, which will provide its clients with high quality products and services. This process will result in an improved efficiency, transparency, and of course competitiveness of SPP on the European gas market, by means of an efficient control system and the elimination of duplicity costs. In the context of restructuring the company is getting ready, through an extensive introduction of a new customer-oriented strategy, for operating a liberalised gas market in line with EU rules.

SPP will further focus on its core businesses, namely on natural gas purchase and sales, natural gas distribution for the needs of the Slovak Republic, as well as the transit of natural gas. SPP will continue to be a reliable and safe partner for its Slovak customers as well as a reliable link on the European gas map.



SPP, joint stock company

- more than 45 years of gas industry in Slovakia
- second largest natural gas transport company in Europe
- purchase and sale of natural gas
- transportation, distribution, treatment and storage of natural gas and its delivery to customers
- transit of natural gas
- services related to the sale of natural gas

Natural gas

- "friendly" energy
- thanks to its properties it is: economical, easy-to-handle, environment-friendly, flexible, easily controllable

Natural gas utilisation

- households • industry • municipal sector
- transport

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Tapping the Full Potential of NGVs

By Jeffrey M. Seisler

Strategic concerns drove the initial development of vehicles fuelled by gas and pioneering countries included Italy, where extensive use dates back to the mid-1930s, and Japan, where there were 800-1,000 operating in Chiba and Tokyo by 1939. More recently, environmental concerns have been added to the equation and today there are some 3.3 million natural gas vehicles (NGVs) worldwide and a network of over 6,600 fuelling stations serving a wide range of fleet and commuter vehicles as well as off-road vehicles, from fork-lifts to ships. The vast majority of NGVs run on natural gas compressed to 200 bar (CNG), with a small number running on LNG.



Early trials with gas-fuelled vehicles used uncompressed manufactured gas like this van operated by the UK's Southend Gas Company in 1934.

In South America, Argentina and Brazil combined have 1.8 million NGVs and a matching fuelling infrastructure of some 1,700 stations; 14% of Argentinian vehicles and almost 2.5% of Brazilian vehicles are driving on natural gas. The markets there are dominated by conversions rather than factory-built, fully warranted NGV technology, although the original equipment manufacturers (OEMs) finally are beginning to provide their own approved conversions in the Ford QVM (qualified vehicle modifier) model. However, the use of different fuel connectors used in the two countries makes cross-border NGV travel difficult.

In the US, with 130,000 NGVs, and across western Europe standardisation of equipment has been more-or-less achieved, and there is growing government support to help stimulate market growth. Italy, for example, now has a 400,000-strong NGV fleet and a network of over 400 refuelling stations which is anticipated to grow to 750 by 2005. But fully coordinated, homogeneous support from the broad gas industry on both continents is lacking, as is the volume of demand for vehicles that could motivate major investments and enthusiasm from the vehicle manufacturers to supply more types of NGVs.

The Asia-Pacific NGV market has expanded impressively in the past few years. Key players include Pakistan with 410,000 NGVs and 420 fuelling stations, India with 159,000 NGVs and 160 stations, and China with 69,000 NGVs and 270 stations. These countries and others are on a sharp growth curve not previously associated with NGVs. Clean air politics and the low cost of natural gas compared to petroleum are key market drivers, but standardisation of equipment and installation is lacking and the OEMs are showing only marginal interest so far.

The changes and growth in many markets over the past two decades are dramatic and impressive. Compared to petrol and diesel-fuelled vehicles NGVs emit far less pollutants. Specific emission reductions depend on different factors (such as the



type and make of vehicle) but on average, anticipated reductions of regulated emissions are: a 77% reduction in NO_x compared to petrol and 80% compared to diesel; 76-95%+ reduction in CO compared to petrol; 85-90% reduction in ozone-forming hydrocarbons; and 20-25% reduction in CO₂ versus gasoline.

NGVs have not yet been able to make the quantum leap into the vehicle and fuels markets to gain credibility as a true alternative to petrol and diesel. The global fleet of 3.3 million NGVs is a tiny proportion of the world's 500 million vehicles. The various commercialisation forces – the availability of NGV technology, growth in the fuelling infrastructure, government support, natural gas industry support and economics – have not yet meshed adequately to support solid, sustainable market growth simultaneously around the world. Moreover, the long-term vision of making hydrogen the fuel of the future has diverted attention from other shorter-term, workable solutions to transportation sector problems associated with pollution reduction and reliance on oil.

Three things must happen to ensure a successful confluence of forces that will enable NGVs to capture a significant market share and achieve their full potential to reduce pollution. Firstly, OEMs who are thinking globally have to act locally; secondly, the petroleum industry should diversify its product mix to include more CNG; and thirdly, NGV standards need to be harmonised internationally.

● The OEMs

In the 1980s and 1990s the large vehicle manufacturers started to think globally. Expansion outside of their normal domestic markets has been a key to survival even as, in the current world environment, survival continues to be a major challenge. For example, the number of chassis (platforms) – the most costly part of vehicle development – is being minimised and spread worldwide in order to sustain the variety of vehicle



NGVs running on LNG tend to be larger, industrial vehicles such as this refuse truck in service in London.

options demanded by customers but at a reduced cost. When it comes to NGVs the OEM mantra for years has been, "Show us a market and we'll show you vehicles". Indeed, some 50 manufacturers make about 150 vehicle and engine models worldwide, more than for any other alternative fuel. But even sales of 20,000 vehicles, a milestone for NGV champions, is only a drop in the manufacturing bucket for an OEM. So what needs to be done for OEMs to profit from NGV sales?

The global philosophy of the OEMs needs to be reformulated into local action. This means that the various active NGV markets worldwide must be evaluated as to the types of vehicle demand that exist and the same OEM NGVs have to be manufactured for those various growing markets. Using the same platforms and existing engines, the currently segmented world NGV markets could be viewed for their combined growth opportunity, which would begin to provide the sustainable vehicle demand needed that will not necessarily be supported alone by markets in the US, Europe and Japan. OEM NGVs with a European Whole Vehicle Type Approval are accepted for registration right across Europe and also in most other countries



with the exception of the United States and Canada (and a few others). With enough worldwide demand for a similar vehicle, even issues associated with downstream distribution and servicing (i.e. training mechanics and providing spare parts) can be overcome if the demand is substantial and sustained. NGV champions worldwide need to work closely with the various OEMs to identify the common vehicle potential that will help generate sustainable OEM profits and simultaneously provide widespread availability of NGVs.

● **The petroleum industry**

For the large oil companies CNG could prove a valuable addition to the arsenal of petrol station products as a hedge against supply shortages and disruptions. Normally service station owners tend to make a higher profit margin on CNG than they do on petrol. For example, BP has found its CNG market to be strong in Egypt and Petrobras is expanding CNG availability throughout its network

of service stations in Brazil.

In some countries, notably Germany, Egypt and Italy, there are oil and gas industry partnerships to sell and/or transport natural gas to customers through a CNG dispenser. In Germany the CNG champions of the natural gas industry have formed financial and marketing alliances with Aral, Shell and Total to introduce 1,000 fuelling stations in the next four-to-five years. In the UK Esso CNG (a division of ExxonMobil) recently invested in three of the world's largest fuelling stations to support a fleet of 80 heavy goods vehicles operated by Safeway. So the message is beginning to emerge, but much more needs to be done to link the CNG advantages to the global growth markets. For those oil companies with thoughts of adding hydrogen to their fuel mix of the future, CNG can provide a valuable stepping stone. Adding CNG to a fuelling station today pays the investment in laying gas pipe to stations where tomorrow natural gas could be reformed on-site into hydrogen. It also offers an opportunity to get building code officials, fire service officials and customers familiar with the advantages of handling gaseous fuels, something that most hydrogen advocates have not even begun to think about.

EUROPEAN NATURAL GAS VEHICLE ASSOCIATION

The European Natural Gas Vehicle Association (ENGVA) is a non-governmental association of NGV stakeholders. Its purpose is to develop a sustainable and profitable market for NGVs throughout Europe by creating a favourable political and economic environment that encourages the development of NGV technology as well as a European fuelling infrastructure. ENGVA supports the direct use of natural gas-to-hydrogen and the long-term use of hydrogen as a vehicle fuel. ENGVA provides a leadership role within the growing NGV industry, but also serves its members to ensure their needs for market development, technology growth and natural gas fuelling are fulfilled.

● **Standardisation**

The widespread patchwork quilt of NGV standards – while admirable in its advances over the past 20 years – still provides a challenge for equipment suppliers who have taken bold steps to internationalise their product distribution. The Italian, US and European standards institutions have led the NGV standards development process. Since 1994 the process of working with the UN World Forum for Harmonisation of Vehicle Regulations¹ to apply some of these standards to nations who have signed specific treaties also has been a step in the direction of helping equipment suppliers build standardised NGV systems to sell in multiple markets. This not only lowers the cost of manufacturing and, thereby, the price to

¹ The United Nations Economic Commission for Europe, Working Party 29 World Forum for Harmonisation of Vehicle Regulations, The Group of Experts on Pollution and Energy.



Our commitment to sustainable development: Putting words into action.

Being involved in the management of one of the planet's great natural resources – natural gas – Gaz de France is bound by five commitments:

Developing forms of energy which are respectful of the environment.

Out of all fossil fuels, natural gas is the cleanest. Making full use of the assets of this natural resource, Gaz de France minimizes the environmental impacts linked to its production, transport and use. It is also developing new forms of environment-friendly energy: being the leading French operator of heating networks using geothermy, Gaz de France also supports the use of renewable sources of energy by working on the complementarity between solar energy and natural gas. To prepare for the future, the Group is conducting research on biogas and hydrogen, particularly through fuel cells.

Developing clean technologies.

Today's development must not be done to the detriment of future generations. Between now and 2007, Gaz de France will significantly reduce the volume of its direct emissions of greenhouse gases in comparison with the level reached in 1990.

It is striving to control its impact on the environment: in the countryside, straight after the laying of a new gas line, the landscape recovers its former

aspect; in urban areas, Gaz de France is developing clean modes of transport using NGV and is involved in industrial ecology.

Its research programmes always include stringent objectives in terms of environmental safety and protection.

Saving energy.

Energy needs worldwide are set to increase faster than available resources. Gaz de France is firmly committed to controlling energy consumption.

Over the past 30 years, the average consumption of a household heating with gas has dropped 40%.

Gaz de France wants to go even further by encouraging its customers to consume more efficiently, through greater concern for the preservation of the environment.

Developing solidarity.

Acting as a responsible company also means contributing to the building of a more cohesive world.

This is the philosophy which guides the Group in its daily relations with its 35,000 employees: Gaz de France promotes social dialogue, training and access to employment for everyone, including the most vulnerable, such as handicapped people. The same

requirement of solidarity applies to the Group's relationship with its most deprived customers.

Sharing a vision.

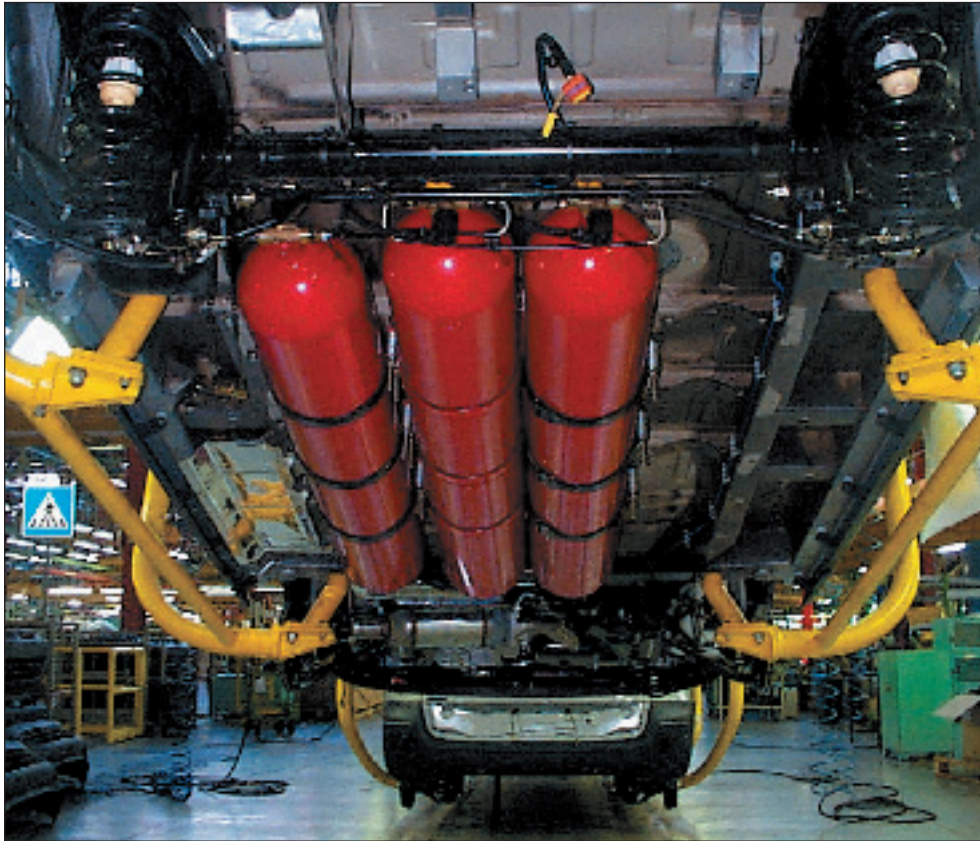
Gaz de France is currently involved in partnerships of conviction.

This is how it joined Global Compact, an organisation created in 2000 under the initiative of the United Nations to bring together companies worldwide on the basis of social and environmental commitments. Last year, the Group also joined the World Business Council for Sustainable Development, the international industry leader on sustainable development.

Through its industrial project, Gaz de France is asserting its will to grow on the European energy market. This project only makes sense if it contributes to better integration of social and environmental equilibria.

The Group has therefore committed itself to a long-term programme in favour of sustainable development.





Many European cities include CNG-fuelled buses in their urban public transport fleets. Fiat Group subsidiary Irisbus manufactures a range of CityClass models and the picture shows the storage position of the gas cylinders beneath the floorpan.

consumers, it also encourages and enhances safety. The International Association for NGVs started an attempt to harmonise NGV standards in 2003 but it is hard to gather experts from every corner of the globe, all of whom need financial support from their companies to facilitate what eventually must become a reality – for CNG, LNG, biogas and ultimately hydrogen.

To truly facilitate the harmonisation of gaseous fuel standards support and leadership is required from governments in the major markets where NGVs are being developed, notably the US, the European Union, Japan and South America. To start the process some of the key country governments should organise an effort – possibly under the auspices of the United Nations – to

develop a regularly scheduled, systematised process by creating a Worldwide Conference on Harmonisation of Gaseous Fuels. The equipment manufacturers of NGVs (and LPG) are nearly the same as those who also are now developing equipment for hydrogen and hydrogen vehicles. A Worldwide Conference on Harmonisation of Gaseous Fuels (WCHGF) would not only benefit NGVs, but it would help smooth the way for hydrogen standards before they face the identical, market hindering problems as have been experienced in the CNG markets.

● **The time is right**

It is necessary to overcome institutional and industry forces that favour the status quo if progress is to be made in developing more environmentally friendly fuels and vehicles. It is not good enough for the major vehicle manufacturers and fuel suppliers to defend their status quo core businesses without some serious expansion outside of their normal mindset. If, with the help of governments and international institutions these industries can be presented with policies and actions that show in a positive-sum fashion the ultimate profit motivation of moving more into NGVs (and bridged with hydrogen in the future), the future will arrive much sooner.

Dr Jeffrey M. Seisler is the Executive Director of the European Natural Gas Vehicle Association (www.engva.org), and is the past president of the International Association for NGVs.



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PetroSA enjoys pioneering status in the GTL conversion technology. We are the biggest and one of only three plants worldwide operating GTL technology commercially to produce transformation fuels. Our conversion process produces cleaner, more efficient and environmentally friendly fuels, petro-chemicals and alcohols. Our high quality products are sought-after in international markets such as Europe, the USA and Asia. In growing economies, we are the leading light in the increasing conversion from crude and coal towards a more reliable and efficient energy resource, natural gas. PetroSA not only leads the way in shaping sustainable solutions in the energy sector, but is also a partner in the energy sector's unrelenting efforts to meet the growing consumer demand for cleaner, reliable and efficient energy solutions. PetroSA is a proud "host sponsor" of the 18th World Petroleum Congress to be held in South Africa in September 2005.

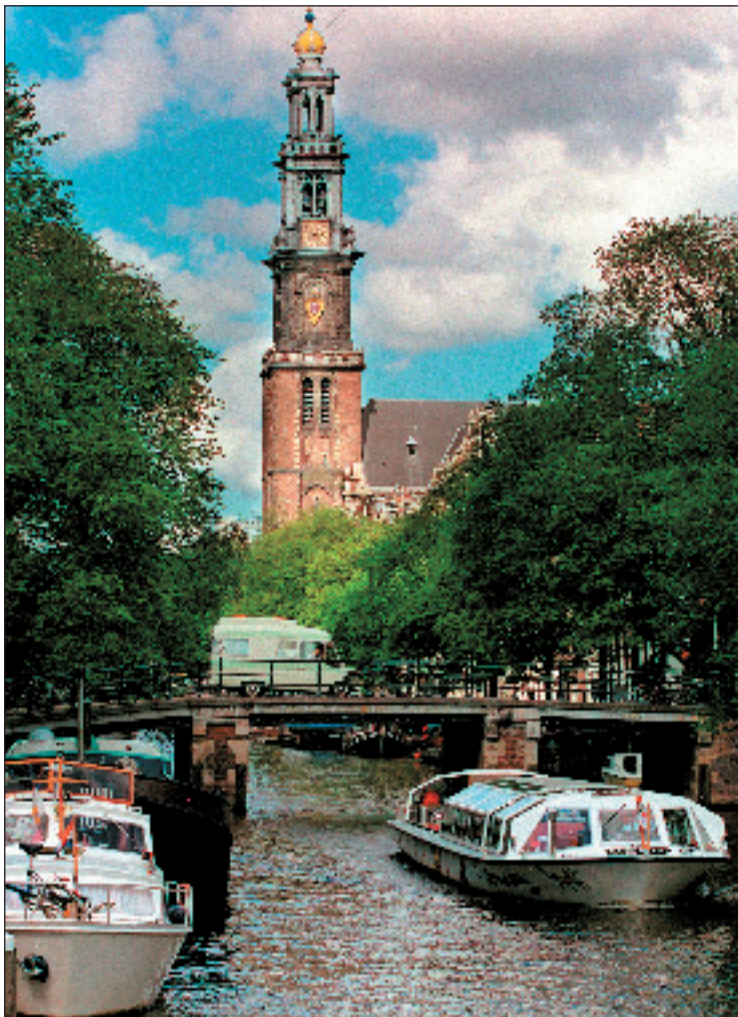




Preparing for the 23rd World Gas Conference

By Robert C. A. Doets

Planning a World Gas Conference is a long-term project and long before the 2003-2006 Triennium started the Dutch National Organising Committee (NOC) had booked a venue and drawn up a marketing plan. The first promotion started at the 22nd WGC in Tokyo, where a website was



Amsterdam will be the host city for the 23rd WGC (ABOVE) and the venue will be the RAI Exhibition and Congress Centre (OPPOSITE TOP).

launched and A5 flyers were distributed via a WGC2006 booth, which was located in the Gasunie stand on the exhibition floor. During the Closing Ceremony, the then IGU Vice President, George Verberg, was given the opportunity to invite all delegates to attend the next WGC in Amsterdam, which he would host as President. Small "origami" leaflets were handed out after the Closing Ceremony.

The 23rd World Gas Conference and Exhibition will be held from June 5-9, 2006. The Opening Ceremony and Dinner will be held on Monday June 5, both taking place in the Amsterdam RAI Congress Centre. The Closing Ceremony and Farewell Party have been planned for Friday June 9.

Key dates in the run-up to the conference are the call for papers in May 2005, the publication of the General Programme and Registration Handbook in November 2005 and the deadline for the submission of abstracts on September 1, 2005.

● Organisation and marketing

Three important national committees are involved in the organisation of the 23rd WGC:

- National Coordinating Committee: George Verberg, Gasunie, Chairman; Jan Korff, EnergieNed, Treasurer; Robert Doets, KVG N, Chairman NOC; Daniel Vlugt, EnergieNed/RWE Obagas, Chairman Exhibition Committee; Bert Panman, Gasunie, Chairman IGU-CC.
- National Organising Committee: Robert Doets, Chairman, KVG N; Henriëtte Schakel, Gasunie; Joop Worm, EnergieNed; Ben Warner, Gasunie.
- Exhibition Committee: Daniel Vlugt, EnergieNed/RWE Obagas, Chairman; Henriëtte Schakel, Gasunie, Secretary; Joop Worm, EnergieNed.

Eurocongres Conference Management has been contracted as the official congress organiser (wgc2006@eurocongres.com).

The general theme of the 23rd WGC is "Gas: Powers the people, Preserves the world, Promoted



by IGU". As noted above a dedicated website was launched in June 2003 and more information will be made available via this site progressively. As of May 2005 it will be possible to submit abstracts and later that year, on-line registration will be possible. Please visit www.wgc2006.nl for the latest details about WGC2006.

● **Venue and hotels**

WGC2006 will be held in the Amsterdam RAI Congress and Exhibition Centre, which is located next to the A10 orbital motorway, has its own railway station and is also well served by trams. The complex is only 10-15 minutes by car or public transport from both Amsterdam's Schiphol airport and the city centre.

RAI Hotel Service has been appointed as the official housing bureau. More than 4,000 hotel rooms in and around Amsterdam, in different price categories have been block-booked.

● **Exhibition**

The exhibition will be held from June 6-9, 2006 and 17,500 square metres net are available in the exhibition halls.



Key dates in the run-up to the exhibition are:

- March 2004* Publication of exhibition prospectus (incl. prices and floor plan)
- June 17-18, 2004* 1st venue inspection for country delegations
- June 2005* Circulation of technical information to exhibitors
- October 13-14, 2005* 2nd venue inspection for country delegations
- June 4-5, 2006* Setting up of the exhibition
- June 6-9, 2006* Exhibition
- June 10, 2006* Dismantling of the exhibition



For the latest information on the 23rd WGC log on to the website at www.wgc2006.nl.

● **Partner programme and technical visits**

In conjunction with the 23rd WGC a partner programme and technical visits will be planned. One of the technical visits will be organised in cooperation with Fluxys in Belgium.

Robert C. A. Doets is the Chairman of the National Organising Committee WGC2006.

Petrobras

Petrobras is the largest state-controlled company in the Southern Hemisphere, and is one of the most recognised and respected energy companies in the world.

To have an idea of the size of the Company, Petrobras, including the recent acquisition of Perez Companc, presently produces 1.9 million barrels of oil equivalent per day. This includes oil, natural gas liquids (NGL) and natural gas. All three products show indications of growth. To refine and process the oil which is produced, the Company now owns 16 refineries, 11 located in Brazil, two in Bolivia and three in Argentina, making a total of 2,109,000 barrels per day of installed processing capacity. Further, the Company has been gaining increasingly more space in the natural gas segment, adding to its reserves and planning the construction of new gas pipelines, with the objective of facilitating natural gas transportation to the large consumer centres of the country. Brazil is the only market in the region, capable of absorbing the South American gas reserves.

Both domestic production and imports are dependable sources of supply for the fuel. By being a more efficient, more economic and cleaner fuel, natural gas should broaden its presence in the Brazilian energy matrix from the present 3% to 7% in 2010.

The comparative economic advantages of natural gas demonstrate the necessity of the Company adopting and following an aggressive policy of production and distribution, so that the total potential consumption is met as soon as possible.

By 2007, the domestic production of natural gas should reach around 54 million m³/day. With the recent discoveries in the Santos Basin, it is expected to reach production to the order of 100



Natural gas processing unit - Guamaré, Rio Grande do Norte.

million m³/day by 2012. The industrial, commercial and large scale service segments, with emphasis on co-generation and distributed generation, should consume 50% of this volume; in the light vehicle, urban light freight carrier and urban collective transport segments, another 20% will be consumed.

Of the remaining 30%, it is estimated that 10% will be absorbed by the residential and commercial sectors and 20% by Petrobras-owned units in thermopower generation.

► Popularisation Programme

To increase these markets, Petrobras is developing a series of initiatives, which will result in a Programme for Popularisation of Natural Gas Use in Brazil with a view to amplifying the distribution network. In remote areas, where the laying of gas pipelines is not viable,

supply will be effected through virtual pipelines which consist of transporting compressed natural gas (CNG) or liquefied natural gas (LNG). The development of new technology is a fundamental factor in the policy to intensify the use of vehicular natural gas.

Petrobras owns, in Brazil, a network of main pipelines of around 8000 kilometres, taking the natural gas to the state distribution companies, the thermopower plants, co-generation plants, industries, residences and gas stations. To meet the increasing demand, especially in the Southeast and Northeast regions, there are projects underway for the laying of a further 3000 kilometres of gas mains.

Petrobras also operates in the thermopower sector, so as to develop the market for natural gas and meet the growing demand for electric power, guaranteeing a continuous and safe electricity supply. This complements the hydropower generation, which is currently the principal source of electric power in the country. It has a stake in 10 plants that are going to add around 4600 MW to the Brazilian energy market. Of this total, three are operating, four are in the final testing phase, two are going to be ready by 2004 and one in 2005. The investment, in partnership with private companies, is approximately US\$3.1 billion.



Urucu industrial complex - Amazonas.

**WHEREVER THERE IS A SOURCE OF
NATURAL AND CLEAN ENERGY, PETROBRAS WILL INVEST IN IT.**

You can't see natural gas, but you can see its effects on the economy and the environment. Natural gas is clean, efficient and economic energy that Petrobras sells and transports through the biggest network of gas pipelines in Brazil – over 8,000 kilometers long. It's no wonder that Petrobras is Brazil's biggest natural gas company, producing over 44 million m³ of gas per day. And that's not all: by 2007, the company plans to increase production to 54 million m³, taking the benefits of natural gas to thousands of Brazilians.





Publications and Documents Available from IGU

As a non-commercial organisation seeking to promote technical and economic progress in the gas industry worldwide, IGU offers its publications free of charge and you are invited to order the IGU publications currently available from the Secretariat. (All documents are A4 format unless stated otherwise.)

2003-2006 Programme

- Strategic Guidelines as approved by the IGU Executive Committee in Tatranska Lomnica on April 10, 2003, (4 pages)*.
- Triennial Work Programme as approved by the IGU Executive Committee in Cape Town on October 28, 2003, (59 pages)*.
- Summary of Triennial Work Programme, (14 pages).
- TWP 2003-2006 session on the 22nd World Gas Conference 2003, (DVD and video).
- Exhibition WGC 2006, leaflet introducing the World Gas Exhibition in Amsterdam, (3 pages).



2000-2003 Programme

- Triennium 2000-2003, TCC Final report, IGU October 2003, (132 pages).
- Triennium 2000-2003, NOC Final report, IGU October 2003, (30 pages).
- 22nd World Gas Conference Tokyo 2003, (DVD).

Scientific and technical papers and documentation

- Global Natural Gas Perspectives, Nebojša Nakićenović e.o., IIASA, IGU, October 2000 (71 pages). This booklet presents research based arguments as to how natural gas appears to be suited to provide a bridge from the current energy system to a new era of more environmentally sound energy systems.
- Natural Gas Supply to 2100, M. A. Adelman and Michael C. Lynch, DRI-WEFA, IGU, October 2002 (51 pages). This booklet outlines the authors' assessment of a long-term supply curve for natural gas using recent estimates of costs and known reserves.
- Seven Decades with IGU, ISC 2003, (186 pages). IGU's 70th anniversary fell in 2001 and at the next World Gas Conference in 2003 this book was launched containing articles on the organisation's history as well as





on current and future issues facing the international gas industry.

- IGU Collaboration Portal course documentation, (55 pages)**.
- Proceedings of the IGRC Conference Amsterdam, November 5-8, 2001.
- Proceedings of the 20th World Gas Conference, Copenhagen 1997, (CD Rom).
- Proceedings of the 21st World Gas Conference, Nice 2000, (CD Rom).
- Proceedings of the 22nd World Gas Conference, Tokyo 2003, (2 CD Roms).
- IGU Triennium 2000-2003 WOC 2 Basic activity study, Worldwide UGS Database, (CD Rom)**.



IGU organisational information

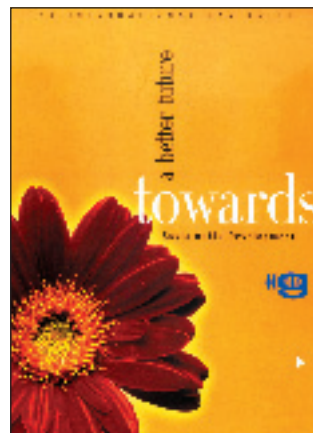
- IGU Articles of Association, as approved by the IGU Council September 18, 2002, (28 pages A5).
- IGU Guiding Principles for Sustainable Development, October 2003, (12 pages A5).
This leaflet contains the recently updated and approved recommendations to IGU Members and the global gas industry regarding responsible behaviour in this context.



- News, Views and Knowledge on Gas – worldwide, (3 pages). This general brochure gives a concise introduction to the organisation together with its Vision and Mission.



- A Better Future Towards Sustainable Development, (5 pages). This brochure highlights IGU's position in promoting natural gas as a part of the solution to climate change.



- IGU Organisation Chart 2003-2006, (3 pages).

* Can also be downloaded from the IGU website

** Can also be downloaded from the IGU collaboration portal

The publications, brochures, DVDs and CD Roms can be ordered (as long as available) from:

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or from the Coordination Committee Secretariat



IGU Events and IGU-related Events 2004-2005

2004

30-31 March
IGE 2004
Kuala Lumpur, Malaysia

26-28 April
4th Latin American and Caribbean
Gas and Electricity Congress
(LACGEC)
Rio de Janeiro, Brazil

27-28 April
WPC Disputes Workshop
London, England

13-14 May
WPC/OPEC Workshop
Vienna, Austria

16-17 May
IGM 93rd Session
Helsinki, Finland

25-27 May
ENGVA Annual Meeting
Graz, Austria

31 May-3 June
GASEX 2004
Singapore

13-17 June
International Conference on
Development in the Gas Industry
of South and East European
Countries in Transition
Belgrade, Serbia and Montenegro

14-15 June
Eurelectric Annual Conference
Lyon, France

5-10 September
WEC 2004 Sydney,
Australia

20-23 September
IGU Council Meeting
Oslo, Norway

29 September-1 October
17th World LPG Forum
Berlin, Germany

8-10 October
IGM 94th Session Berlin, Germany

12-15 October
WPC Youth Forum
Beijing, China

26-28 October
IANGV 2004
Buenos Aires, Argentina

31 October-3 November
IGRC 2004
Vancouver, Canada

2005

14-15 April
IGU Executive Committee
Warsaw, Poland

23-25 May
IGU/ICT Global Congress
Pusan, Korea

26-30 September
WPC 2005
Johannesburg, South Africa

17-20 October
IGU Council Meeting
Tianjin City, China

You can find links to many of the above events by visiting www.igu.org and clicking on "Events". Under "Energy-related Events" in the drop-down menu you can also find a link to the WEC Events Calendar displaying a multitude of energy-related events in 2004.

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The Dynamic World LNG Trade: Dado Galdieri/AP (88).

Enron's Ghost Still Haunts the Energy Industry: Ron Sachs/Rex Features (100), TXU (103).

Belgrade Conference to Foster Gas Development in Transition Economies: Gas Association of Serbia and Montenegro.

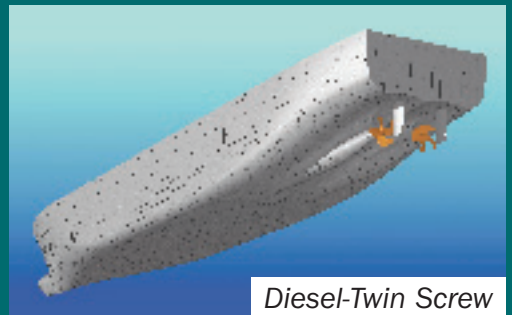
Tapping the Full Potential of NGVs: National Gas Archive National Grid Transco (114), Chive Limited (115), Fiat (118).

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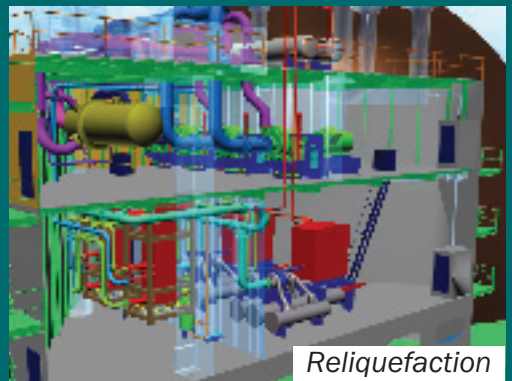
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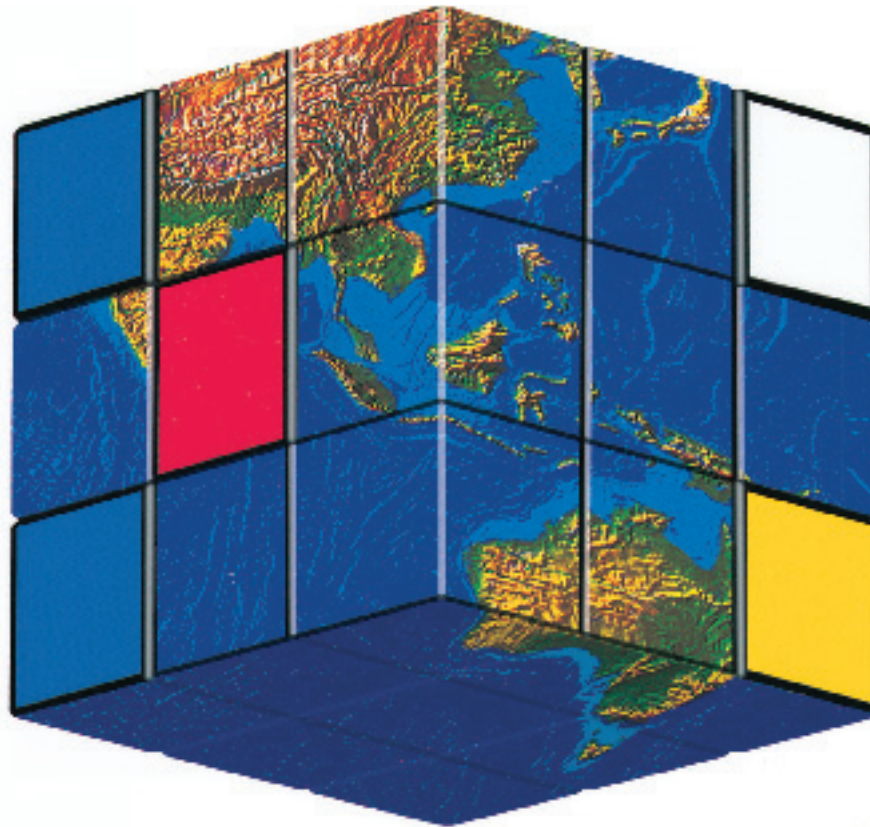


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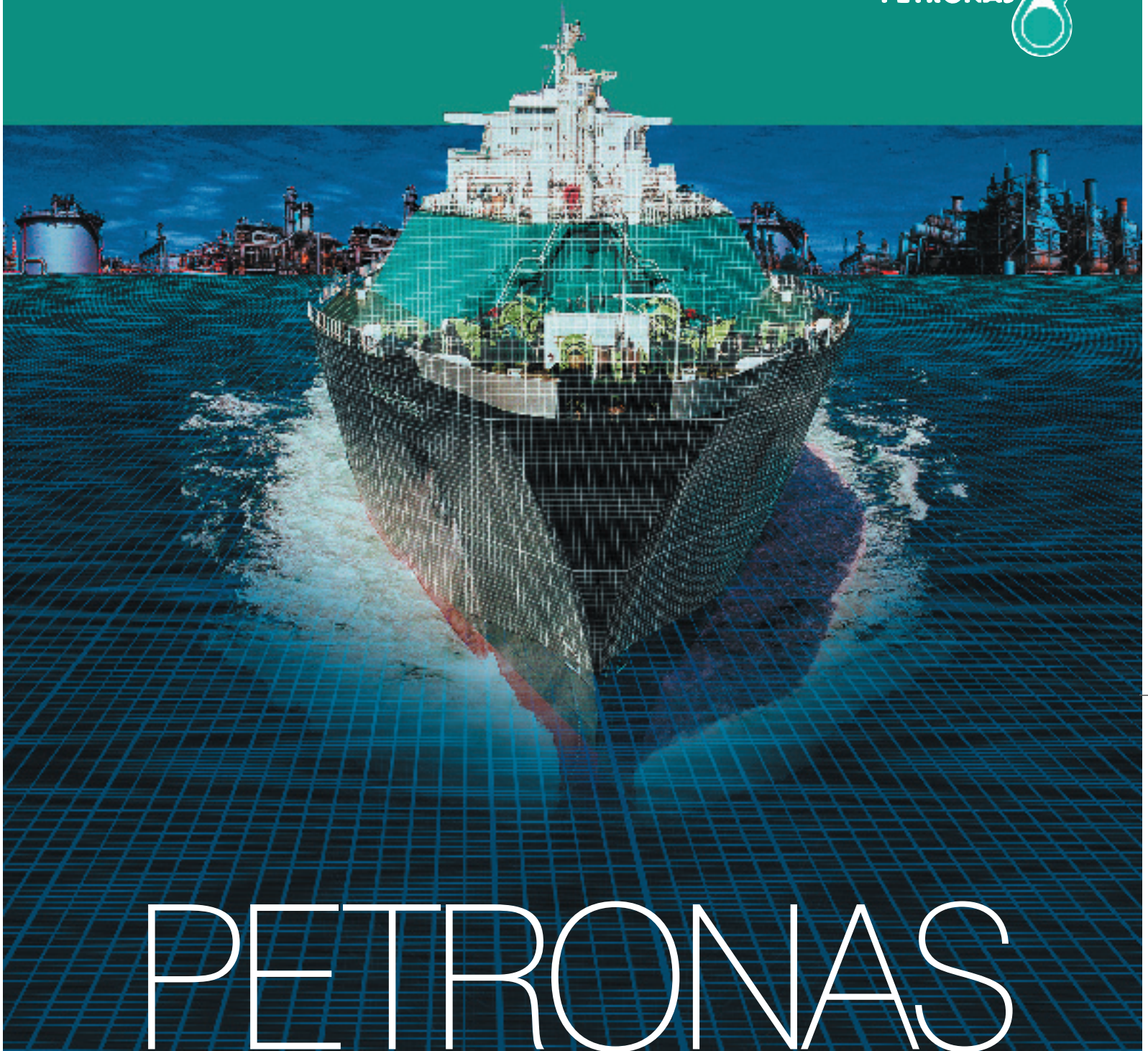


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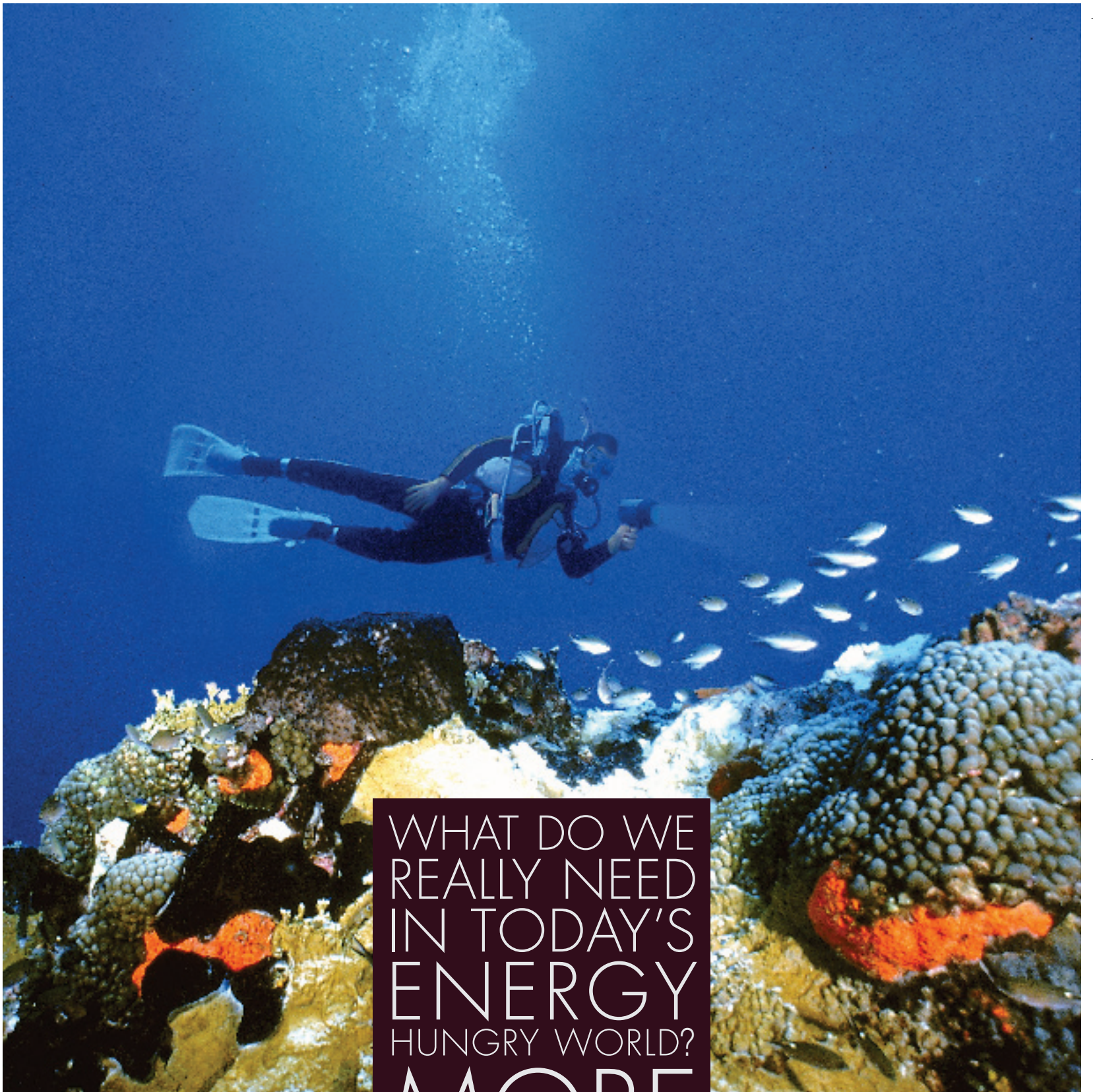
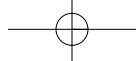
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