Keynote speakers

J. van der Veer, President of Royal Dutch Petroleum and CEO Royal Dutch/Shell
A. B. Miller, CEO Gazprom
K. Anzai, Chairman Tokyo Gas & Chairman Japan Gas Association
F. Chapman, CEO BG Group plc
T. Desmarset, CEO Total
B. Bergmann, Chairman of the Executive Board E.ON Ruhrgas
Tan Sri Hassan Marican, President and CEO Petronas
J-F. Cirelli, CEO Gaz de France
P. Banerjee, Chairman and Managing Director GAIL (India) Ltd.
Mrs V. Cox, Chief Executive Gas, Power, Renewables IS&T BP plc
S. Ewing, Chairman American Gas Association
F. Al Suwaidi, CEO Qatar Petroleum
D. Yergin, Chairman Cambridge Energy Research Associates (CERA)
C. Mandil, Director International Energy Agency (IEA)

Panellists

Mrs C. Spottiswoode (energy consultant and former UK regulator)
Mrs L. Cook, Shell
A. Haced, Sonatrach, Algeria
R. Brandt, MetroGas, Argentina
Mrs R. MacDonald, BHP Billiton
D. Bensdorp, Gasunie Trade & Supply, The Netherlands
J. Ulrich, Centrica, UK
T. Torevund, Norsk Hydro, Norway
J. Seisler, European Natural Gas Vehicles Association (ENGVA)
J. Vasconcelos, Council of European Energy Regulators (CEER)
J. Hederman, Federal Energy Regulatory Commission (FERC), USA

Second members' survey

The second survey of members was held during the fourth quarter of 2004.

During October 2003 the first IGU Improvement Survey was conducted. This was the baseline case for consecutive surveys in order to be able to monitor changes in members' opinions with regard to IGU. The baseline survey was held among members of the Executive Committee and Committee chairs from whom we received 28 answers. The results were covered in the first CC progress report of the Dutch Triennium, which was published on the Collaboration Portal and in the March 2004 issue of *International Gas*.

The Improvement Survey seeks to identify the extent to which IGU meets its goal of facilitating the exchange of information, the extent to which IGU achieves its vision and goals, and to what extent the added value of IGU membership meets the expectations of the members. The objective is to indicate areas for improvement, which will enable IGU to improve its performance and deliver higher-quality services to its members.

Results of the second survey

About 700 people including members of the Executive Committee, Committee leaders and members as well as others involved in IGU were invited to participate in the second web-based survey, which consisted of 42 questions in two batches. Some 86 members (12%) eventually participated. As some respondents did not answer all questions, the final conclusions are based on a range of 55 to 86 answers. The answers are considered a good indication of the opinions of the whole group of 700. Half of the respondents are involved in IGU as Committee or Study Group members, while the other half are involved as members of the Executive Committee or leaders of Committees or Study Groups (i.e. chairs, vice chairs or secretaries). Of the latter half, some 56% have been involved in IGU for longer than two years.

Exchange of information

Just as the first survey showed, respondents considered that the most important means of gathering information are personal contact and meetings.

About 60% of respondents are of the opinion that IGU could do more to provide information for its members. Some 85% of respondents feel that IGU should provide tailor-made information, while 75% are prepared to pay for this information.

In general members visit both the main IGU website and the Collaboration Portal a few times per month. The website is mainly used for general information and information from previous Triennia. The Collaboration Portal is visited by 85% and is mainly used for downloading documents (progress reports) and consulting committee meeting information (agendas). Some 70% of respondents feel that the Collaboration Portal is contributing to the success of the implementation of the TWP, while 60% rate the overall quality of the Portal as good to very good.

Achievement of vision

Of the respondents 28% (33% in 2003) think IGU achieves its vision completely, 72% (63% in 2003) think IGU achieves its vision partially and 0 (4% in 2003) think not at all. The difference between 2003 and 2004 is considered statistically significant.

Added value

Networking possibilities and sharing knowledge are considered the most important aspects of the added value of IGU membership. In total 57% rated added value from IGU membership good to very good. (In 2003 this was 60%, the difference between 2003 and 2004 is not considered statistically significant.)

Conclusion

The main conclusion is that IGU in general is doing a good job, but that members expect IGU to do more with respect to providing specific information. Therefore, as an experiment we have organised an IGU Knowledge Centre – ikc@wgc2006.nl. This will provide free information to members for small questions and will issue a quotation for more elaborate questions. (*See Table 1 for a selection of questions received.*) The added value of this information service will be analysed at the end of the Dutch Triennium and recommendations will be made about a possible follow-up if so desired.

From the answers of the respondents it is clear that the Collaboration Portal plays an important role in providing information, although improvement is called for (which is now implemented). The future of the Portal will be discussed with the IGU Secretary General and the incoming Argentinian Presidency.

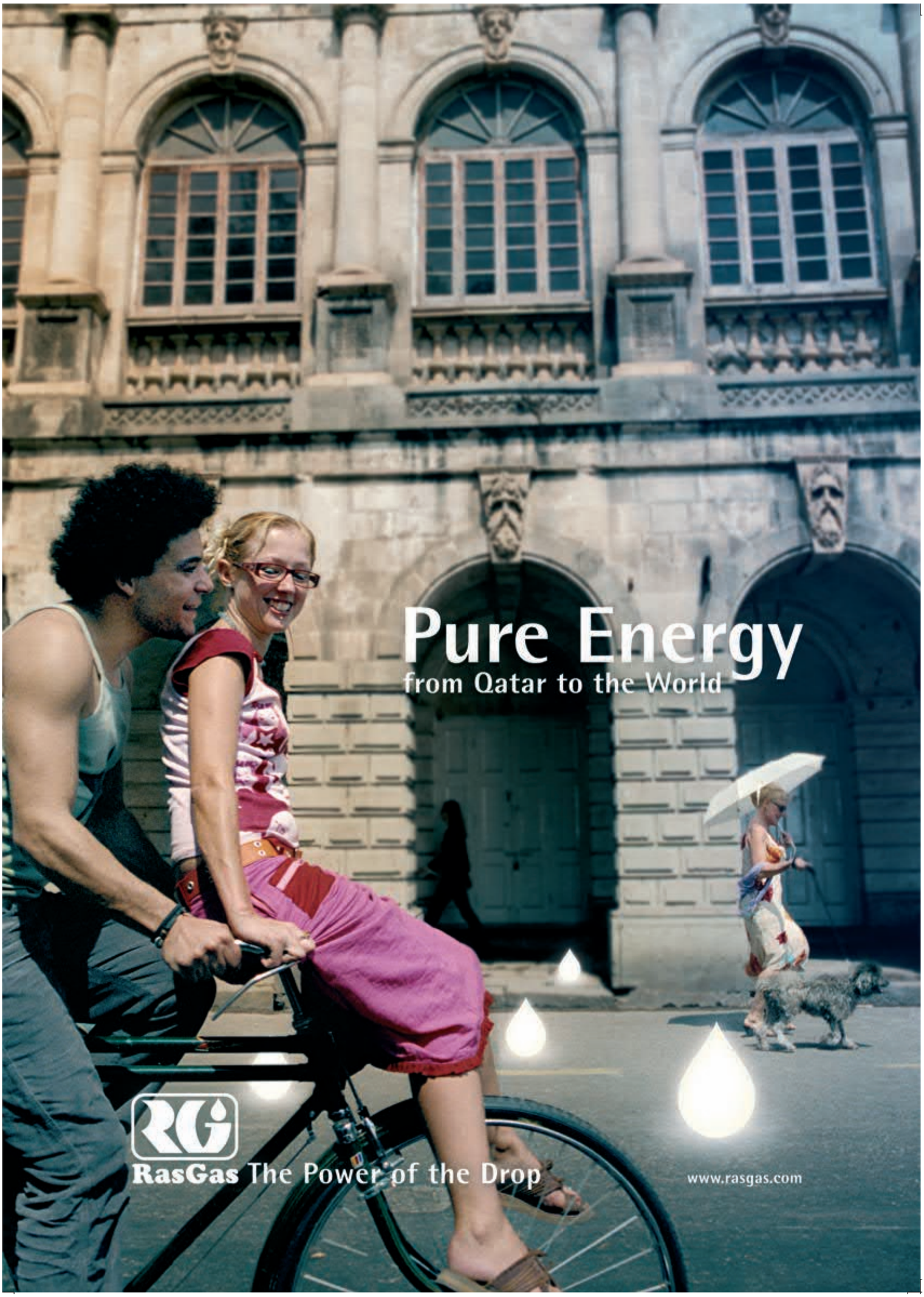
The conclusion with respect to the changes since 2003 as regards the question whether IGU achieves its vision is mixed. No one answered that IGU is not achieving its vision at all, which is a positive sign. But the percentage of respondents that thinks IGU achieves its vision completely decreased from 33% to 28%. To address this a number of vision papers on specific items will be issued and the first on sustainability is currently being prepared.

With respect to added value (around 60% good to very good) so far no changes in the attitude of

BELOW
Table 1.

SELECTION OF QUESTIONS RECEIVED BY IGU KNOWLEDGE CENTRE (1ST HALF 2005)

Question on	*From*
Gas expansion	IGU member
Gas quality standards	IGU member
Include logos of gas companies in WGC2006 handbook?	IGU
Transit tariffs	IGU member
Gas statistics	IGU
Trends in residential energy consumption (gas especially)	World Bank
End-user energy demand-scenarios for the future	International Economic Platform for Renewable Energies (IWR)
Household gas penetration around the world	ABN Amro Asia
Future supply and demand (IGU view)	IGU member



COMMITTEE MEETINGS DATES AND VENUES SPRING 2005

Committee	*Spring 2005*	*Attended from IGU Management by*
WOC 1	March 16-18, Belgrade, Serbia and Montenegro	
WOC 2	Joint meeting April 11-13, Moscow, Russia	Storm, Brandt, Aptroot
WOC 3	Joint meeting April 11-13, Moscow, Russia	Storm, Brandt, Aptroot
WOC 4	Joint meeting April 11-13, Moscow, Russia	Storm, Brandt, Aptroot
WOC 5	May 2-3, Opatija, Croatia	
PGC A	April 18-20, Esfahan, Iran	
PGC B	Joint Meeting April 18-20, Noordwijkerhout, The Netherlands	Storm, Panman, Aptroot
PGC C	Joint Meeting April 18-20, Noordwijkerhout, The Netherlands	Storm, Panman, Aptroot
PGC D	Joint Meeting 18- 20 April, Noordwijkerhout, The Netherlands	Storm, Panman, Aptroot
CC	April 14-15, Warsaw, Poland	All
TF R&D	Joint Meeting April 18-20, Noordwijkerhout, The Netherlands	Panman, Kidd, Aptroot
TF ICT	ICT Congress May 23-25, Busan, Korea	Verberg, Storm, Panman

ABOVE
Table 2.

the respondents is indicated. Implementation of the measures indicated above and the presentation of the results of the work so far in the period up to the 23rd WGC may improve that.

The complete results are published on the Collaboration Portal (Coordination Committee/ library/survey results).

Meetings and visits

The CC Chairman and Secretary held several teleconferences with the Committee chairs and secretaries.

Several coordination meetings were held with the National Organising Committee (NOC) of WGC2006.

On January 25 the President and Secretary General, the CC Chairman and Secretary and the NOC Chairman met to discuss a range of issues including the preparation of the Executive and Co-ordination Committee meetings in Warsaw, Poland.

Prior to the joint meeting in Moscow a visit was paid to PromGaz on April 11 by the Project Adviser for Gas to Power, Dick de Jong, and the CC Secretary to discuss the Russian contribution to the Special Projects on Gas to Power and Sustainability – Bridging to the Future.

On the April 13 the CC Secretary attended the final panel of the conference on gas transmission at the premises of VNIIGAZ in Moscow.

Meetings of Committees and Task Forces

All the Committees and Task Forces have held their spring meetings and report on their work in the next chapter.

During the joint meeting in Moscow several workshops were held. The presentations given during the opening session of the joint meeting and the workshops are available on the website.

During the joint meeting in Noordwijkerhout an LNG workshop was held where the committee members discussed several aspects of the world LNG market.

Preparation for the 2006-2009 Triennium

The Council meeting being held in October in Tianjin City, China will select the Charter Members that will take responsibility for the chairmanship and vice-chairmanship of the Committees for the 2006-2009 Triennium according to Article 9.7 of the Articles of Association. Within one month after the Council meeting the selected Charter Members will propose their candidates for the chairmanship and vice-chairmanship.

Making headway in their preparations for the next Triennium, the Argentinian team is currently working on the guidelines of the 2006-2009 TWP and will give a brief presentation on their preparations to the October Council meeting.

QUESTIONNAIRES DURING THE 2003-2006 TRIENNIUM

Subject	*Committee*	*Period*	*Published*	*Audience*
General IGU	CC	Q2 2003	www.SurveyMonkey.com	EXC and Committee Chairs
General IGU	CC	Q4 2004	www.SurveyMonkey.com	All Committee members
Standardisation of LNG qualities	PGC D SG1	Q1 2004	E-mail	PGC D members
Safety of LNG plants and vessels	PGC D SG2	Q4 2004	Letter	Plant and terminal managers, vessel owners, IGU members and members of the Society of International Gas Tanker and Terminal Operators (SIGTTO)
Acid gas injection	WOC 1	Q3 2004	Portal and e-mail	WOC 1 members
What are the world's most significant gas fields?	WOC 1 SG 1	Q2 2004	www.SurveyMonkey.com	Operators of some significant gas fields and WOC1 members
Glossary on UGS terminology	WOC 2 SG1	Q3 2004	E-mail	WOC 2 members
UGS: Achievements and trends in the field of technical efficiency, environmental stability and safety	WOC 2 SG2	Q3 2004	E-mail	WOC 2 members
UGS environment related	WOC 2 SG3	Q3 2004	E-mail	WOC 2 members
Global review of third party access	WOC 3 SG1	Q2 2004	E-mail	WOC 3 members
Address increasing difficulties to create offshore infrastructure	WOC 3 SG3	Q12005	Email	Gas industry
Address increasing difficulties to create onshore infrastructure	WOC 3 SG3	Q1 2005	Portal and e-mail	WOC 3 members
Pipeline integrity	WOC 4 SG1	Q4 2004	E-mail	WOC 4 members
Best practices	WOC 4 SG2	Q2 2004	E-mail	WOC 4 members
Research and technology	WOC 4 SG3	Q2 2004	E-mail	WOC 4 members
Installation Cost 1	WOC 5 SG2	Q4 2004	E-mail	WOC 5 members
Installation Cost 2	WOC 5 SG2	Q4 2004	E-mail	WOC 5 members
Appliances data	WOC 5 SG2	Q4 2004	E-mail	WOC 5 members
District heating	WOC 5 SG2	Q4 2004	E-mail	WOC 5 members
Indoor air quality	WOC 5 SG2	Q4 2004	E-mail	WOC 5 members
NGVs	WOC 5 SG3	Q4 2004	E-mail	WOC 5 members
GTP in South America	Special Project GTP	Q1 2004	E-mail and letter	Gas industry, power industry, authorities in South America
GTP in Europe	Special Project GTP	Q2 2004	E-mail and letter	Gas industry, power industry, authorities in Europe
Investment in research and technology	Task Force R&D	Q3 2005	E-mail	Companies involved in IGU committees

Furthermore, in March and June 2006 the incoming CC chairs and the Secretary General will meet to discuss the final structure of the TWP.

The Committees are in the middle of their respective studies and working on different questionnaires. In *Table 3* you will find their respective questionnaires as they have been produced so far. In some cases the special IGU-funded site for carrying out questionnaires (SurveyMonkey.com) is used. This website has the advantage that it produces the analyses in the form of histograms directly online.

BELOW
Table 3.

GAZPROM

the World's Largest Gas Company

By Alexei B. Miller

Gazprom is the world's largest gas company engaged in prospecting, production, transportation, storage, processing and sales of natural gas and other hydrocarbon products.

The major shareholder in Gazprom is the Russian Federation. The company's Management Committee is headed by Alexei Miller.

Gazprom's gas resources are estimated about 28 trillion m3, which equals 16% of the world's and 60% of Russia's aggregate. Gazprom produces 20% of the world's gas and 86% of all gas produced in Russia. Gazprom group companies produced 545.1 billion m³ of gas in 2004.

Gazprom's performance in 2004 proves its solid financial and economic standing, as well as its great potential for further dynamic growth.

EXPORT PERFORMANCE

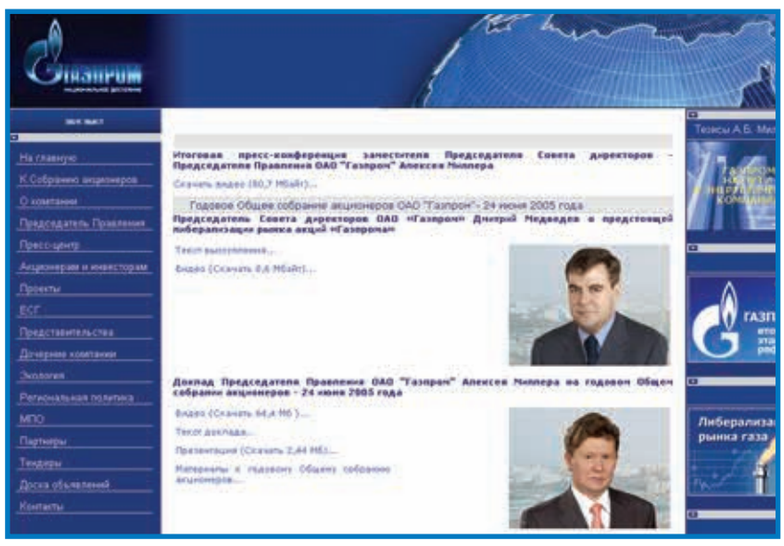
Gazprom, which supplies 25% of Europe's gas market and boasts a domestic market share of more than 70%, exports to 21 nations: Germany, Italy, Turkey, France, Hungary, the Czech Republic, Poland, the Slovak Republic, Austria, Finland, Romania, Bulgaria, the Netherlands, Serbia & Montenegro, Greece, Slovenia, Croatia, Switzerland, Belgium, Bosnia & Herzegovina and FYR Macedonia.

Gazprom has safely supplied Russian natural gas to Europe for over 30 years, always meticulously upholding its export commitments. Gazprom has proved to its international partners its reliability and responsibility for European energy security.

Gazprom operates with Europe under long-term contracts exceeding 20 years in duration, which bind the company to supply a total of over 2.1 trillion m³ of natural gas, which amounts to 7% of Gazprom's prospected gas reserves.

As Europe's natural gas market undergoes liberalisation, Gazprom is implementing a more energetic marketing policy, promoting new trading formats and methods, including swap deals, one-off and stock exchange transactions, short-term contracting and electronic commerce.

www.gazprom.ru



Gazprom's strategic objective is to become a global energy player ruling the world market.

For the achievement of this goal, Gazprom consistently diversifies its markets, product portfolio and supply routes.

Gazprom is currently looking into ways to boost exports and build up its transportation facilities to meet Europe's gas needs, which are forecasted to increase.

Specifically, Gazprom is soon to bring its Yamal-Europe and Blue Stream gas pipelines to full capacity.

Major preparations are underway for the Northern Europe Gas (NEG) pipeline to be built across the Baltic Sea. The NEG pipeline will mainly draw on the Yuzhno-Russkoye oil and gas field, estimated to hold over 1 trillion m^3 of gas. Once the NEG pipeline goes into operation, Russia will be able to supply its natural gas to Europe directly, without having to transit through other countries. Construction of the NEG pipeline, slated for launch in 2010, is expected to begin in the autumn of 2005.

As a strategic export priority, Gazprom is working to enter new Asian-Pacific markets. Gazprom is also active in the fields of liquid hydrocarbons and electric power.

Gazprom is currently preparing to go ahead with its project to supply liquefied natural gas to North America, drawing mainly on the Shtokmanovskoe gas field in the Barents Sea. The project to supply liquefied gas, worth an estimated US$10 billion, is expected to take five or six years to complete.

STRUCTURE

Gazprom is working to improve its internal management structure, having recently embarked on phase two of its reforming, aimed at optimising daughter company management. From now on, Gazprom daughters will rigidly specialise by business type, i.e. prospecting, production, transportation, storage, processing and sales. The reform will leave Gazprom daughters more transparent and better managed within the group's top-down integrated corporate structure.

Another step that will take Gazprom a long way towards its strategic goal to become a global energy player is the upcoming liberalisation of its shares, a move designed to attract first-class strategic investors and boost capitalisation.

INTERNATIONAL COOPERATION

Gazprom is always open to expanding its business with international partners inside and outside the International Gas Union. Gazprom currently chairs the IGU's Working Committee 2 (Storage) and, from June 2006 on, will preside over Working Committee 1 Exploration and Production).

Gazprom takes part in IGU's conferences on natural gas research agendas, and hosts exhibits and conventions for IGU representatives to update them on Gazprom's expertise in natural gas production, processing, storage and transportation.

In collaboration with its IGU partners, Gazprom analyses and summarises the international experience in gas industry in order to absorb and utilise best practice and thus contribute to the industry's success.

Alexei B. Miller is the Chairman of the Management Committee of OAO Gazprom.

Alexei Miller was born in Leningrad on January 31, 1962. In 1979 he finished secondary school and enrolled in the Institute of Economics & Finance (IEF) named after N. Voznesensky in Leningrad.

After graduation, Alexei Miller worked as an engineer and economist at the General Planning Studio of LenNIIproyekt, the Leningrad civil engineering research and design think-tank reporting to the Executive Committee of the Leningrad City Soviet.

In 1986 Mr Miller enrolled in a graduate course at IEF. He wrote his dissertation and obtained the degree of Candidate Doctor of Economics in 1989.

Mr Miller joined the IEF staff as a junior research fellow in 1990. The same year he was appointed to head a subsection at the Economic Reform Committee of the Executive Committee of the Leningrad City Soviet.

From 1991 through 1996, Alexei Miller worked at the External Relations Committee of the Mayor's Office of the now renamed St Petersburg and headed the Market Watch Department at the External Economic Relations Office. He subsequently headed that office and was also deputy to the Chairman of the External Relations Committee.

From 1996 through 1999 Mr Miller worked as Director of Development and Investment at St Petersburg Seaport, and from 1999 to 2000 he was General Director of the Baltic Pipeline System.

In 2000 Alexei Miller was appointed deputy Energy Minister of Russia. He has chaired the Management Committee of Gazprom since 2001.

Alexei Miller has been awarded the Medal for Outstanding Services to the Fatherland II Degree Order, the II Class Order of the Hungarian Republic Cross for his outstanding services to the energy cooperation, and the Sergiy Radonezhsky II Degree Order of the Russian Orthodox Church, Patriarchal Merit Certificate.

Progress Reports from the Committees

This chapter contains news and information from IGU's Working and Programme Committees.

Working Committee 1 Exploration and Production

WOC 1's fourth meeting of the 2003-2006 Triennium was hosted by NIS-Naftagas in Belgrade, Serbia and Montenegro. It was attended by 15 Committee members who made sure that the two days were well spent by working and socialising hard. The hosts made the Committee very welcome, providing three interesting presentations about the company, its exploration and production techniques and technology. Nahum Schneidermann, attending his first WOC 1 meeting, gave an insightful presentation about world gas use and possible future developments, while the two Study Groups made progress on their work.

SG 1.1 has the task of identifying the world's most significant gas fields and decided the final format for its main session as well as the report. The first draft of the report will be ready for WOC 1's autumn meeting. It will contain data sheets on gas giants as well as other significant gas fields and then an analysis based on our criteria of what makes a gas field "significant". Several speakers have already been identified for the World Gas Conference and others will be selected from the special call for case studies. An interim meeting in Paris was held at Cedigaz's offices to track progress and make sure the work is still on target. The format for an on-line vote to allow registrants for WGC2006 to express their views on the world's significant gas fields has been designed and sent to the IGU Secretariat for consideration.

SG 1.2's remit covers new horizons for exploration, production and gas treatment. Several draft sections of the report for WGC2006 had been circulated before the meeting and were discussed with all members present. Responsibilities for the main session and expert forums were shared out and each member left with a clear idea of what needed to be achieved before the autumn meeting. Some speakers have already been recruited.

The assessment panel for the abstracts from the call for papers was decided as well as how we intend to use the contributions. The next meeting date was set for September 28-30 in Korea and is kindly being hosted by the Korea Gas Corporation and Korea Gas Union. The meetings held in the first half of 2005 and planned for the rest of the Triennium are detailed in *Table 1*.

Members

Vadim Kobilev has left WOC 1 and Vladimir Yakushev joined the team as our new Vice Chairman.

RIGHT
Table 1.

WOC1 MEETINGS

	Date	*Host*	*Venue*
2005	March 16-18	Branislav Tomović, NIS-Naftagas	Belgrade, Serbia and Montenegro
	September 28-30	Ki-Hwan Park and Jeong Hwan Lee of Kogas and Korea Gas Union	Je-Ju Island, Korea
2006	Spring	Leopold Bräuer, ÖMV	Vienna, Austria

There are now 47 members of WOC 1 and the geographical split is: Africa (two), Asia (13), Australia (one), Europe (29), North America (one) and South America (one).

● Working Committee 2 Storage

WOC 2 met for the fourth time on April 13 as part of the joint meeting with WOCs 3 and 4. This was hosted by Gazprom in Moscow with delegates arriving on April 11, meetings on the 12th and 13th and technical visits on the 14th. A total of 120 people participated, which we consider very successful.

We organised a joint workshop with WOC 3 on "Security of gas supply – interaction with pipelines and underground storage (UGS)". There were six presentations from the point of view of the exporting and importing countries, and a separate opinion presentation by the USA. The topic is a wide-ranging one and it is not easy to analyse the interaction of pipelines and UGS. Nevertheless, the workshop was very useful even though lack of time kept the discussions short. CDs with the presentations were issued and distributed to WOC 2, 3 and 4 members, as well as being sent to the IGU Secretariat and CC for follow-up and publication on the Portal. The experience will help in preparing a WOC 2 session (dealing with storage only) for WGC2006 in Amsterdam.

At the Moscow meeting the progress of the Study Groups was discussed and it was agreed that their final reports should include more effective case studies. The structure of the WOC 2 sessions at WGC2006 was discussed and preliminary moderators of the expert forum were appointed. During the WGC we aim to cover all aspects of underground gas storage from means and techniques to improvement of performance. There will be a special report of Study Group 2.3 on environmental issues. We will have three expert forums in Amsterdam (all other Committees will have two), dealing with new technologies such as CO_2 sequestration and the commercial aspect of UGS usage.

WOC 2's next meeting is scheduled for the first week of October in Prague. We will discuss the drafts of the Study Group reports and approve papers selected for the WGC. We also plan to organise a workshop on numerical simulation of UGS reservoirs.

As we have to submit Study Group reports by February 1, 2006, we will have the subsequent meeting in mid-January 2006 in Paris to review and approve the final version of the Committee report.

Study Groups

SG 2.1 covers basic UGS activities. The main aim is to update the global database of underground gas storage facilities. So far replies have been received from operators responsible for around 90% of the world's UGS capacity. The Study Group has data from the previous survey covering a further 8%, but new UGS data is still coming in.

In the updated version very detailed information from the USA and Canada on UGS will be included. The database will be very useful for further analyses. We intend to finalise the database and to prepare some general trends per country. Common trends on UGS will also be possible.

Additionally a glossary of main terms was prepared and approved during the Moscow meeting. This glossary will be translated into different languages. Currently it is ready in English and German.

The two other Study Groups are working on achievements and trends in the fields of safety, technical efficiency and environmental impact. It was decided that for preparation of the questionnaire it would be useful to merge the two Groups. However, during the process of analysis the answers will be split. The questionnaire has been sent out and so far 15 answers have been received. We expect to get 10 to 12 additional answers from the main players in the underground

gas storage market. The preliminary data analysis was discussed during the Moscow meeting.

● Working Committee 3 Transmission

WOC 3 has 61 members (40 delegates, 20 alternates and one associate). The spread over the continents of the Committee is Africa (two), Asia (10), Australia (one), Europe (45) and South America (three).

The Committee met for the fourth time as part of the joint meeting with WOCs 3 and 4, which was held in Moscow in April. Three workshops were arranged: the joint one with WOC 2 "Security of gas supply – interaction with pipelines and underground storage", plus workshops dealing with corrosion and pipeline integrity. The latter subject is also covered in an article in this issue of the IGU magazine (*see pages 130-138*) written jointly with WOC 4.

WOC 3 members made some suggestions about improvements for future joint meetings. It was felt that the overall number of questions should be reduced, that a direct question and answer session with the audience should be organised and that discussions between the different WOCs should be encouraged. The Study Groups also presented progress reports during the meeting.

SG 3.1 The second questionnaire was sent out in January and 20 countries answered it. The basic results were presented in the Moscow meeting and it was agreed that the conclusions would be ready by September. A question about security of supply was also presented to the members.

SG 3.2 Some presentations about stress corrosion cracking were made during the Moscow meeting as part of the Study Group's work on stress corrosion detection.

SG 3.3

Onshore: The questionnaire was sent to WOC 3 members in January. A report with the results was due to be presented in September.

Offshore: This Study Group is carrying out a state-of-the-art evaluation of pipeline solutions for deep water with a focus on transport solutions that can provide high transport capacity. A progress report was given by Mr Hamre during the Moscow meeting.

SG 3.4 This Study Group had its fourth meeting in Washington DC, March 9-11. It is progressing in its comparative analysis of incident databases and the first draft report for WGC2006 has been finished. Active collaboration from Canada, Russia and USA has been achieved.

Meetings

The fifth meeting of WOC 3 was due to be held in Norway, September 12-14, and the sixth is scheduled for Italy, February 27-March 1, 2006.

● Working Committee 4 Distribution

There are 37 countries represented on WOC 4 as members, associates or observers: Africa (one), Asia (10), Australia (one), Europe (20), North America (three) and South America (two).

The fourth meetings of WOC 4 and its three Study Groups were held in Moscow in April as part of the joint meeting with WOCs 3 and 4. Joint workshops on topics of common interest shared by the three Working Committees were held. Joint workshop topics were: "Security of gas supply – interaction with pipelines and underground storage", corrosion and pipeline integrity. WOC 4 members made presentations on corrosion and pipeline integrity.

The Committee has forwarded to the CC some proposed topics and schedules for the preliminary World Gas Conference programme. The Committee has also identified key research topics for gas distribution and sent them to the CC as information for the R&D Task Force. Continuing liaison with the latter is planned.

Gas Natural SDG, S.A. was due to host the fifth meetings of WOC 4 and its three Study Groups in Barcelona, Spain, September 18-21. Meeting six is scheduled for the Slovak Republic in late March 2006.

SG 4.1 (Pipeline integrity) has received responses from 16 countries on distribution integrity issues. A brief follow-up questionnaire is being processed at this time. The final study is planned to address the following: cost-benefit analysis; risk analysis and how it is used to generate planned maintenance or replacement; reliability and quality of data leading to improved safety and better life expectancy predictions; third party damage issues; and new technologies used in distribution integrity. A first draft of the final report was due to be reviewed at the September meeting.

A report on the US study on distribution integrity sponsored by the American Gas Foundation was made during the Moscow meeting.

SG 4.2 (Best practices) has selected seven topics on which to collect data concerning the construction and operation of distribution networks. The general data collection from 15 countries for Phase 1 has been completed and summarised. The five top-performing companies in each topic area of the questionnaire were determined and are being queried in Phase II in order to identify their specific practices. These reported "Best practices" are to be included in the draft final report. This draft was due to be reviewed at the September meeting.

SG 4.3 (R&D in the gas industry) has reviewed responses to a questionnaire from 18 countries showing some results of worldwide gas market liberalisation and their potential impact on gas distribution research. Management, financial and efficiency issues relating to operating cost reductions appear to be the driving forces within our utilities at this time. The focus is on short-term research successes. Japan and France appear to be the only countries that have specific national R&D programmes. A draft final report was due to be reviewed during the September meeting.

● Working Committee 5 Utilisation

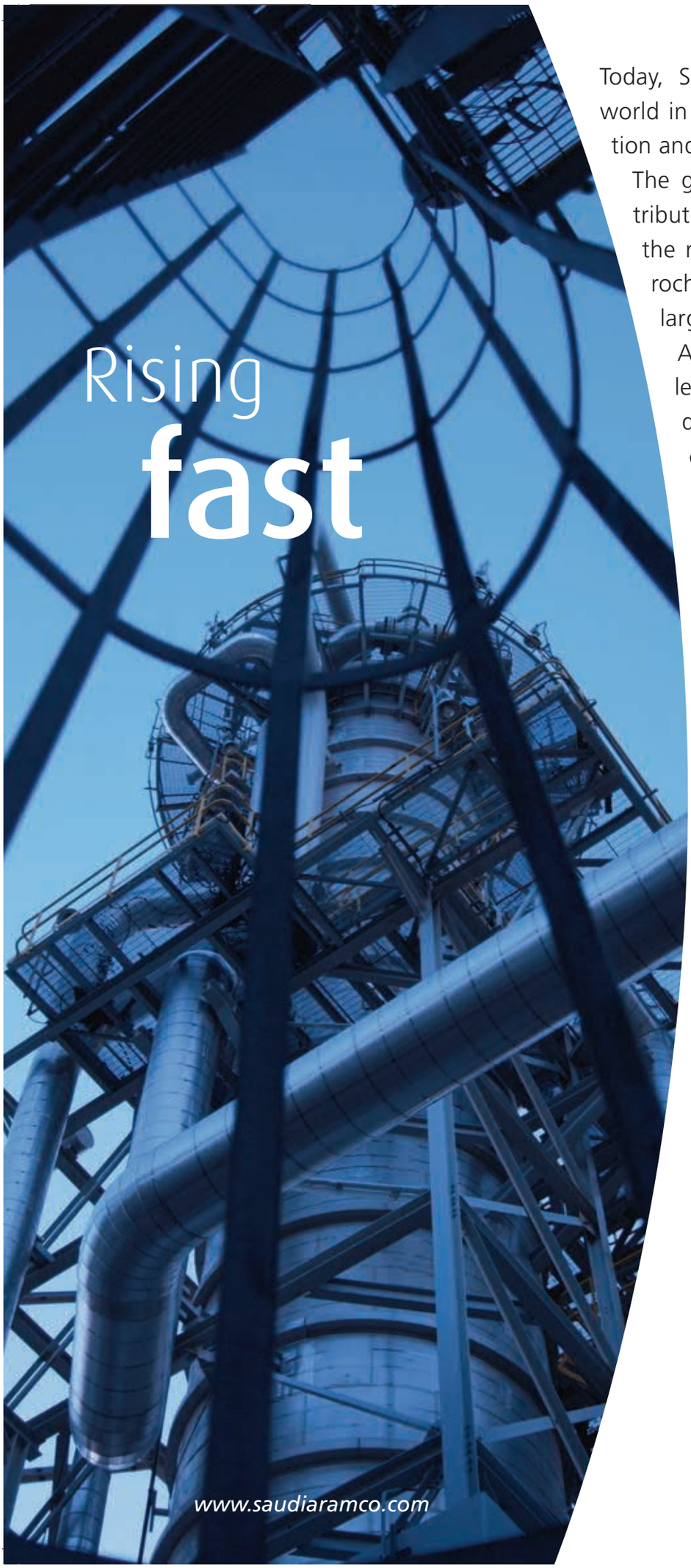
WOC 5 has more than 80 members from 38 countries. It held its fourth meeting in Opatija, Croatia, May 2-3. There are four Study Groups.

SG 5.1 Industrial Utilisation – Howard Levinsky

Industrial end users are faced with substantial challenges arising from the drive towards sustainable development. They have to combine higher energy efficiency, to reduce CO_2 emissions and primary fuel consumption, with a major reduction in pollutant emissions to reduce the impact of the industrial activities on the environment. Moreover, they need to improve the quality, flexibility and reliability of their production processes to limit the consumption of raw materials.

SG 5.1's work restarted in September 2004 at a meeting hosted by Gaz de France. The Study Group's targets were revised at this and the following meeting in Vancouver in November 2004 to inventory the challenges to industrial gas utilisation (regulatory, economic, customer needs, sustainability, etc.) and the technological means to address them. To maximise input to the inventory a questionnaire on international practice was developed in January 2005 and sent to all WOC 5 members and other parties who are intimately acquainted with the issues involved in industrial gas utilisation. Also included were questions regarding impediments to the implementation of new technology and ways to overcome them, as well as questions concerning technological R&D for this sector.

The response to the questionnaire was discussed in May at a Study Group meeting in Paris. An interesting result from the preliminary analysis was the observation that, by and large, regulatory issues such as CO_2 (Kyoto) and NOx emissions were not seen as substantial challenges for



Today, Saudi Arabia ranks fourth in the world in gas reserves and ninth in production and is rising fast.

The gas discovered, produced and distributed by Saudi Aramco has impelled the rapid growth of the domestic petrochemical industry, one of the world's largest.

And, once again, Saudi Aramco is leading the way to expand the Kingdom's gas resources and production capabilities.

Over the last two years, we've enlisted the partnership of international majors to further increase gas reserves and production. Four joint ventures have begun exploration work in the Rub' al-Khali, or Empty Quarter.

Gas growth beckons further profitable investments along the entire value chain.

After three decades of extraordinary expansion, the Saudi gas sector is still rising. And Saudi Aramco is making it happen.

ارامكو السعودية
Saudi Aramco
Energy to the world

industrial utilisation, whereas more customer-related issues such as matching the combustion system to the production process and energy efficiency were seen as important issues. The results are being analysed further and will serve as input for the report to the World Gas Conference.

At the same meeting the contribution to WGC2006 was developed in more detail. The contribution of the Study Group will comprise a report and a round-table. The report will give a presentation of the background, method and results of the questionnaire. The analysis of the results obtained, particularly the international business perception of the challenges to industrial gas utilisation, will also be discussed. The challenges facing industrial gas utilisation will be presented as background for the round-table. The latter will be a panel discussion with a number of experts in the field, who will discuss the challenge given to them in the introduction. Tentative panel members include a director of R&D from a large industrial end user of natural gas, a manager/director from a gas trading company, a director of research from a natural gas research centre and an independent expert on the transition to sustainability.

SG 5.2 Domestic and commercial utilisation – Jean Schweitzer

The utilisation of gas for domestic and commercial markets represents about 10% of the total gross energy consumption worldwide and this share is growing. The development of the gas market is today one of the most effective solutions for saving energy and reducing CO_2 emissions.

The work of the Study Group is a continuation of that carried out in the previous Triennium under SG 6.1, and is influenced by the changes that are seen every day in the new energy market: the appliances of tomorrow will be multi-energy and most of the gas companies will also sell electricity or other forms of energy.

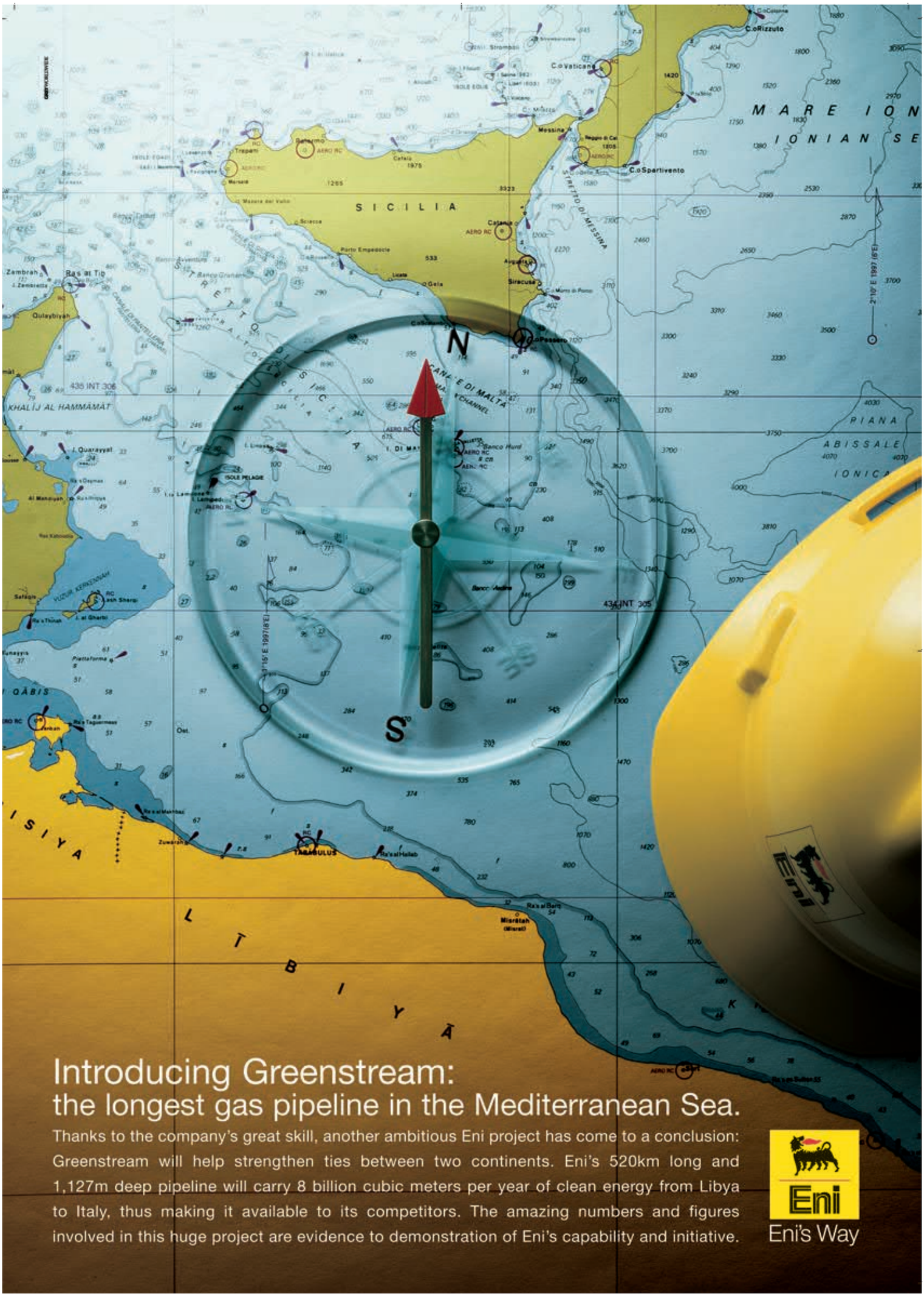
The targets are to: assess the potential and impact of the new gas technologies in the domestic and commercial sectors; assess the potential of gas-powered air conditioning (with a case study); study installation costs; and establish a permanent database of installed domestic appliances in coordination with Marcogaz, GERG and possibly other organisations that have data and that can share the market knowledge. The database already exists as a result of the work of the previous SG 6.1, but needs to be completed and verified/fine-tuned. The database will be useful for the studies of IGU and the other organisations. The database will also avoid the duplication of work and questionnaires in IGU and other organisations.

The work was organised into several topics that were to be placed under the responsibility of one or several experts in the Group:

1. Indoor air quality (Japan);
2. Central heating/district heating (Russia);
3. Air conditioning (France);
4. Low installation costs (Denmark);
5. Integrating safety functions (Belgium);
6. Combining different forms of energy (Switzerland); and
7. New technologies (all).

Due to the lack of commitment of experts we have been abandoning a number of topics and have reorganised the work around a website of innovative gas appliances. The URL for this is: http://gergpc.dgc.dk/public/Appliances_database/index.htm. For the time being we have about 40 appliances in the database. Questionnaires have been circulated internally to the Group members. We are collaborating with a Canadian research centre on the topic of low installation costs.

Beside the topics above the Group has started a report about reinforcing the presence of gas in the domestic and commercial sectors when facing new challenges. In the domestic sector it is important to consider the future of central heating boilers. More of tomorrow's customers are likely to want air



Introducing Greenstream:
the longest gas pipeline in the Mediterranean Sea.

Thanks to the company's great skill, another ambitious Eni project has come to a conclusion: Greenstream will help strengthen ties between two continents. Eni's 520km long and 1,127m deep pipeline will carry 8 billion cubic meters per year of clean energy from Libya to Italy, thus making it available to its competitors. The amazing numbers and figures involved in this huge project are evidence to demonstration of Eni's capability and initiative.

conditioning and some may also want to produce their own electricity. There is certainly a future for those multi-generation systems based on gas or gas with renewable energy. Another question is whether those systems will be individual or shared ones such as smaller district heating systems (see the EU energy service directive).

The work done in the Group should throw light on some of the points above and will be presented at WGC2006 with a report and a round-table.

SG 5.3 Natural gas for vehicles (NGV) – Davor Matic

The objective of the project called "Global opportunities for natural gas as a transportation fuel for today and tomorrow" is to demonstrate long-term key factors for development of natural gas as a transportation fuel. It will also highlight the implications and risks for the gas industry of future development and investment programmes in NGVs. Targeted forms of CH_4 utilisation that will be observed more closely are: compressed natural gas (CNG), liquefied natural gas (LNG), biogas and hydrogen produced from natural gas.

The final report will provide:

- An overview of the existing fuels and technologies and analysis of future development;
- Country reports;
- Overviews of existing technologies used in each country;
- Trend analysis;
- Worldwide coverage of NGV market development schemes and strategies, reasons and key drivers – "from scratch" until today;
- A strength, weakness, opportunity, challenge (SWOC) analysis;
- A scenario matrix (recommended actions and strategy along the development path); and
- Clear recommendations to stakeholders (gas industry and decision makers) to help to stimulate the market in a positive way and to identify what actions should be avoided (to learn from previous mistakes).

The Chairman of SG 5.3 is Davor Matic from Energy Institute Hrvoje Pozar in Zagreb, Croatia, and the Vice Chairman is Björn Ahlnas from Gasum in Helsinki, Finland. Dr Garth Harris, Secretary General of IANGV and Dr Jeffrey Seisler, past president of IANGV and present Executive Director of ENGVA, will be acting as consulting partners to provide guidance, participation and information to this project.

Experts and country representatives that are participating in the project are from the following countries: Algeria, Argentina, Austria, Belgium, Croatia, Denmark, Egypt, Finland, France, Germany, Iran, Italy, Japan, FYR Macedonia, Malaysia, The Netherlands, Poland, Russia, Spain, Sweden and Switzerland.

The Group's first draft report was distributed among the relevant experts (outside the Group), who provided valuable comments and recommendations on technical issues. The report was then discussed at the last meeting in Opatija.

Group members and partners decided on very clear recommendations to stakeholders (gas industry and decision makers), based on the data and analyses provided through synthesis of the results of questionnaires (country reports) and the established technical database. During the meeting Jan Zakovec provided a scenario matrix for biogas and Jeffrey Seisler provided one for CNG. The scenario matrix for LNG had already been delivered by Björn Ahlnas.

The first draft report also includes worldwide coverage of NGV market development schemes and strategies, reasons and key drivers – "from scratch" until today, with an analysis of convergences at the level of different regions.

SG 5.3 gave a presentation on its activities and input to WGC2006 during a meeting of the ENGVA Technical and Marketing Committee in Prague in March. Similar presentations were made for meetings of IANGV's Technical Committee and Council during the Annual European NGV Conference, which was organised by ENGVA in Bolzano, Italy in June.

For the worldwide coverage of NGV market development schemes and strategies, reasons and key drivers – "from scratch" until today, a country-by-country update will be provided (together with fine-tuning of existing data) using documents from the IANGV NGV 2004 Conference ("Road to a Better World" – Buenos Aires, Argentina, October 26-28, 2004), the ENGVA 11th Annual European NGV Conference ("A Profitable Environment for NGVs" – Bolzano, Italy, June 8-12) and the Asia-Pacific NGV Association's (ANGVA) 1st Asia Pacific Natural Gas Vehicles Conference & Exhibition (July 26-28, Kuala Lumpur, Malaysia).

The NGV Association of Latin America (ALGNV) has expressed interest in cooperating with SG 5.3 and preparation of the country report for Brazil based on an IGU questionnaire is underway. Also underway are negotiations with other ALGNV country representatives.

The deeper involvement of countries from the Asia-Pacific region has been discussed with representatives of ANGVA.

Finally, preparation of the country report for the United States is underway.

At the Opatija meeting SG 5.3's contribution to WGC2006 was discussed. It was agreed that together with the presentation of the Study Group's report, a round-table should take place. Here two of the most suitable cases to support the conclusions and recommendations to the stakeholders will be selected and presented (showing the influence in real life – on sales figures – of positive decisions as well as the mistakes made in the past). Also, as a part of the round-table, representatives of the NGV associations (IANGV, ALGNV, ENGVA, ANGVA, NGVRUS etc.) will be invited to take active roles in the discussion about key drivers, future options and past mistakes in the development of natural gas for transport markets in their regions.

IANGV will have a two-hour slot for a panel on the strategic aspects of natural gas usage in the transport sector where challenges for NGVs will be discussed. The Study Group will support the IANGV session with the results of its work. Additionally WGC2006 will devote 7000 square metres to an NGV pavilion.

SG 5.4 Distributed energy generation: from CHP to micro generation – Samuel Bernstein

Combined heat and power (CHP) is one of the most efficient gas technologies. It has been well developed in Europe, Japan and North America and represents a key issue for gas development.

CHP research and development is focused on two main issues: improving technologies and installation rules for medium- and small-scale cogeneration. Medium and small CHP has faced some difficulties in entering the market and developing sales. The investment price, operation and maintenance costs are too high for commercial or small industrial plants. New technologies, such as micro turbines, or technology improvements, such as catalysts, new engine designs and regulation systems, could improve the situation. Packaging will also be a very relevant topic. Standard rules for installation, and especially electrical connection to the grid, must be defined. Last but not least, incentives and barriers must be analysed, in order to allow structured and coordinated lobbying at a regional level.

Sizing down by using emerging technologies may allow micro-cogeneration to enter the residential market. To analyse that trend and share answers, WOC members will study distributed power generation and CHP plants in their own countries from the technical, economical and legal points of view. The synthesis will enable the drawing of some general conclusions on the future of distributed generation development.

Members of SG 5.4 presented two papers in international technical meetings on behalf of the Committee during the first half of 2005: in January (Microturbine Conference) and May (Croatian Gas Association). The work of the Group includes: ongoing discussion/exchange, site visits, a database on the technologies, a status report and

Internet links (which will be reviewed by experts of the Group). Finally, plans are being formulated for a round-table at WGC2006.

Meetings

WOC 5 will hold its next meeting in Prague, Czech Republic, October 13-14. The spring 2006 meeting is scheduled for Moscow, Russia, April 20-21. Individual Study Groups have additional meetings planned.

● Programme Committee A Sustainable Development

The fourth PGC A meeting was held in Esfahan, Iran, April 18-19 and was attended by 13 members.

A selection/evaluation committee to review the papers for WGC2006 was appointed consisting of Mojtaba Shariaty (Head), Tjerk Veenstra (Deputy Head), Knut Barland (Reviser), Luis Gorospe (Reviser), Seung Min Park (Reviser) and Daniel Arias (Approver).

For the sessions in the conference the following topics were selected:

- New technology, gas and sustainability;
- Other subjects: clean development mechanisms (CDM) from an international organisation, e.g. the United Nations; and
- Production, exploitation and the environment (latter from non-governmental organisations).

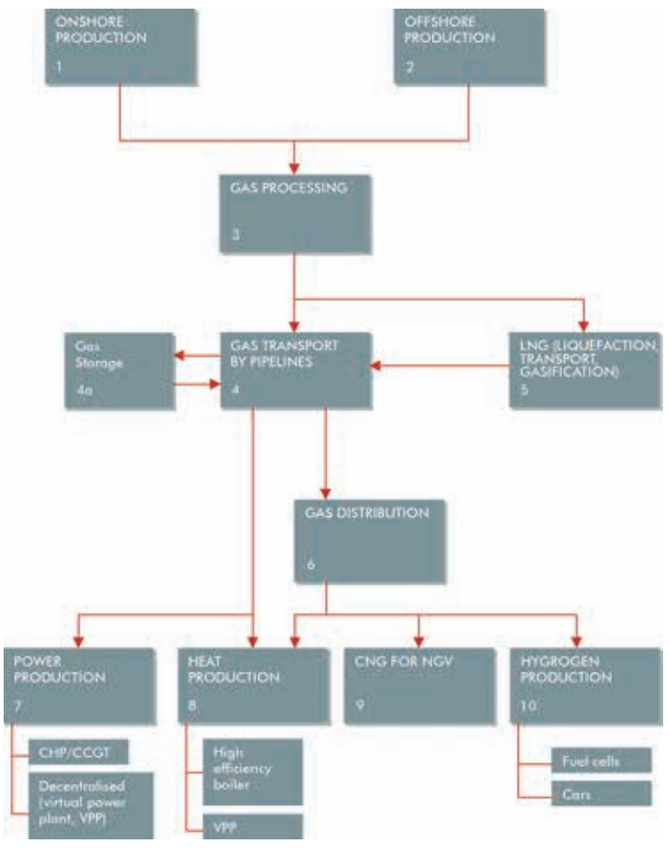
It was agreed that the following subjects will be part of the Committee's report and the members herein below mentioned will be in charge of writing about three pages of the assigned subject, as follows:

- NGV: Faramarz Joulani and Daniel Arias;
- New technologies and sustainability: Hossein Bahmanyar and Mojtaba Shariaty;
- Countries with large reservoirs: Asghar Soheilypour and Mojtaba Shariaty;
- Jepma & Nakićenović report on IGU-sustainability: Tjerk Veenstra;
- Education and universities: Hossein Bahmanyar and Mojtaba Shariaty; and
- Role of natural gas in the carbon market: Hyo Sun Min and Seung Min Park.

It was decided in the first PGC A meeting that the goal of Study Group A.1 should be to make a life cycle analysis (LCA) of the whole gas chain. A high quality LCA study could be the backbone in IGU of all data and the source of all the arguments that IGU uses to show and prove the benefits of natural gas. It was decided that we should focus only on natural gas and not to make a comparative study with other fuels. Only in the end-use stage can we highlight the benefits of natural gas by comparing with alternative fuels. A draft model of the natural gas chain is shown as *Figure 1*. It was a basis for further discussion in the Group.

BELOW
Figure 1.

DRAFT MODEL OF NATURAL GAS CHAIN



We collect the performance data of the global warming potential (CO_2 and CH_4), acidification potential (NO_x and SO_2) and energy use due to operations. We do not include the impacts during construction and use of materials (steel fabrication, transport of material etc.). However, if possible we might try to get some general information on construction impacts.

In the final report each part of the chain should contain the following items: a technical description; sources of emissions and energy use; and emission data, based on data from the gas industry.

At the beginning of April Tjerk Veenstra circulated a first draft containing the technical descriptions of all parts of the gas chain. This draft was prepared in cooperation with Marcogaz, with which IGU is cooperating on this project. Marcogaz has been collecting emission data from the gas industry since 1998. The draft content of the report is:

- Summary;
- Introduction;
- Description of the gas chain;
- Production;
- Transmission;
- Storage;
- LNG;
- Distribution;
- End use;
- Source of emissions;
- Emission data and energy use;
- Emission data for each type of end use;
- Comparison with other fuels;
- Conclusions; and
- Recommendations.

Programme Committee B Strategy, Economics and Regulation

PGC B and its three Study Groups took part in the joint meeting in mid-April in Noordwijkerhout, The Netherlands. There, PGC B took the opportunity to have short joint meetings each with PGC C and PGC D where some open questions could successfully be solved. The work of PGC B concentrates on three major items: the Committee report, the technical programme and a key message.

Committee report

PGC B's three Study Groups cover the issues of strategy and regulation (SG B.1), gas supply (SG B.2) and gas demand (SG B.3), and are examining these predominantly from the economic aspect. Whilst SG B.2 and SG B.3 will use existing data from other organisations to evaluate and then to analyse and forecast supply and demand development under global and regional aspects, the task of SG B.1 is entirely new for IGU. It will examine the effect of different regulatory regimes on the progress of the gas industry in several countries, with emphasis on the lessons to be learnt.

Technical programme

The posters and presentations in the expert forum at WGC2006 will be subject to the result of the call for papers. For its oral presentations outside the expert forum PGC B will not rely on the outcome of the call for papers, but is inviting renowned speakers to talk about key issues. Most of the speakers have already expressed their willingness to present a speech, so the oral sessions of PGC B should be of great interest.

Key message

At the suggestion of the IGU President, PGC B is preparing a key message on the issue of the development of international gas markets covering:

- Market trends;
- Analysis of demand;
- Analysis of supply;
- Factors of influence such as regulation, trade, climate change, pricing and investment; and
- Conclusions and recommendations.

This document will hopefully be a sophisticated "look into the crystal ball" and may gain some momentum once in the hands of investment brokers and market analysts.

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PGC D MEMBERSHIP STATISTICS

	Nominated
Countries represented	30
Gas associations represented	28
Associate Members represented	6
Total number of PGC D members	68
Members	37
Alternate members	19
Corresponding members	2
Representatives of Associate Members	7
PGC D Staff (Chairman +Vice Chairman +Secretary)	3

ABOVE
Table 2.

PGC B will have its next meeting on November 22 in Buenos Aires to finalise its Committee report.

● Programme Committee C Developing Gas Markets

PGC C has 49 members from Africa (four), Asia (12), Australia (one), Europe (29), South America (two) and the World Bank (one). During the first half of 2005 Mr L. Marchesi of Eni resigned as Secretary due to increasing work commitments and Mr M. Gianninoto, also from Eni, took over the position.

The Committee held its fourth meeting in Noordwijkerhout, The Netherlands, April 19-20. Some 20 members from 17 countries participated. At the same venue PGC C held a joint meeting with PGC B and a further joint meeting with PGC B, PGC D and Task Force R&D dealing with LNG issues.

The main topics addressed during the meeting were to review early drafts of the reports for the four case studies that are being developed and to start preparing PGC C's participation in WGC2006.

The material prepared by the relevant Study Groups, following the definition of "Key Elements" as approved in the previous meeting in Cairo and specific meetings held by some of the Study Groups, was presented and discussed. In addition, the time schedule and deadlines to deliver draft reports for each task as well as for the overall Committee report were defined.

SG C.1 presented a draft of the contribution that PGC C will provide to a panel discussion on "Developing Gas Markets in Asia" during the October IGU Council meeting.

The organisation of the sessions allowed to PGC C at the WGC 2006 was outlined:

- Two main sessions will be dedicated to the presentation of the case studies, followed by a discussion panel, with participation of invited experts; while
- Two sessions will accommodate technical forums, where contributed papers will be presented and discussed.

The next meeting is scheduled for October 6-7 in Rio de Janeiro, Brazil.

Contributions to conferences and workshops

During the first half of 2005 PGC C participated in the workshop "LNG – Making gas markets global", jointly organised by IEA and Gas Infrastructure Europe (GIE)/Gas Liquefied Europe (GLE), May 19-20 in Paris. The Committee may contribute to other events organised by IGU on gas to power.

● Programme Committee D LNG

The total of PGC D's members and experts in Study Groups is 87 of which 68 are the nominated members to the Committee (*see Tables 2 and 3*). The 19 experts are nominated to the three Study Groups and come from Africa (four), Asia (three) and Europe (12).

There has been no change to the Committee's organisation with its three Study Groups and one New Actors Group. The Chairman of PGC D is coordinating three activities: LNG organisations, LNG conferences and coordination within IGU. All members have been introduced to the

Collaboration Portal and lists of PGC D Study Groups are filed in the Portal. However, some access problems still exist and access has been reset for all members reporting problems.

Following the September 2004 Arzew (Algeria) meeting reported in the last issue of the progress report, PGC D and Study Group meetings have been held as follows:

- Bilbao (Spain) March 15 SG D.2;
- Nordwijkerhout (The Netherlands) April 19 SG D.1, SG D.3;
- Nordwijkerhout (The Netherlands) April 20 PGC D;
- London (UK) June 14 SG D.2.

The next meetings of the Committee and the Study Groups will be held in Hammerfest (Norway), October 4-7. During these meetings it will be decided if it will be necessary to have other meetings before June 2006.

Since the last progress report the following members have been nominated to PGC D:

Mr Sang-youp Lee from Kogas (Korea) as a member;

Mr Paul F. Habelko from Chevron (USA) as a representative of an Associate Member;

Mr Shammi Herai from Tractebel (UK) as a representative of an Associate Member;

Mr Dumltru Rotar from S.N.G.N. Romgaz (Romania) as a representative of an Associate Member; and

Mr Simon Syndenham from Centrica (UK) as SG D.1 expert.

The following have ceased PGC D activities:

Dr Peter Taff (UK);

Mr Win Dam (The Netherlands);

Mr Keyman Kim (Korea); and

Mr Philip Olivier (Tractebel, Belgium).

SG D.1: Standardisation of LNG qualities

SG D.1 is led by Robert Klein Nagelvoort (The Netherlands) and has 19 members representing the following countries: Algeria (two), Belgium (two), France (one), Finland (one), Iran (one), Italy (two), Japan (one), The Netherlands (two), Norway (two), Qatar (one), UK (three) and USA (one).

Following the second meeting of the Group in Arzew, the Chairman proposed a draft of the Group's final report which was discussed at the third meeting in Nordwijkerhout. The draft reaffirms the commitment to simplify the LNG trade, through clear and more uniform LNG standard qualities. It also calls for a comprehensive review of both economic and technical factors influencing the decisions of individual participants in the LNG trade with regard to decisions affecting the quality of the LNG that can be produced or received at their facility.

SG D.1 is continuing its work to shed light on the technical and economic issues surrounding gas quality. During the Nordwijkerhout meeting significant input was received from the European Association for the Streamlining of Energy Exchange (EASEE-gas), which has proposed a detailed quality specification that all imported gas – including LNG

PGC D REPRESENTATION OF COUNTRIES IN THE LNG BUSINESS

	Real	*IGU Member*		*PGC D Nominated*	
		Number	*%*	*Number*	*%*
LNG importing countries	13	12	92%	8	62%
LNG exporting countries	12	11	92%	7	58%
New LNG importing countries in 2007/8	6	5	83%	3	50%
New LNG exporting countries in 2007/8	6	4	67%	2	33%

LEFT
Table 3.

– will have to meet. Changes in specifications that recently occurred in Japan were also reported, as well as developments in other key markets.

The Group agreed in principle that the final report should contain a proposal for three trading qualities of LNG, expressed in terms of "inter-changeability boxes" (boundaries on Wobbe and HHV) as well as limits on impurities. Currently the Group is working on the compilation of its report, the first version of which will be presented at the fourth SG D.1 meeting to be held in Hammerfest.

SG D.2: Safety and technology developments in LNG terminals and vessels:

SG D.2 is led by Bruno Larsen (Norway) and has 19 members representing the following countries: Algeria (two), China (one), France (one), Indonesia (one), Iran (one), Italy (two), Japan (one), Korea (two), The Netherlands (one), Norway (two), Qatar (one), Spain (one), UK (two) and USA (one).

The Group has looked at codes and standards and drawn up a questionnaire with a supporting table to report use of standards and codes at LNG terminals and onboard LNG vessels in order to identify safety gaps. The questionnaire was sent out in November 2004 to an extended list of plant and ship operators, but a low response was received.

The Group's report will be structured into sections covering:

- Safety in LNG plants, vessels and receiving terminals;
- Technology – import and export terminals; and
- Technology –vessels.

Contributions to the report are coming in from members of the Group. A draft of the report was reviewed and discussed during SG D.2's fifth meeting in London on June 14.

SG D.3: The future of the LNG spot market

SG D.3 is led by Dr Bo-Young Kim (Korea) and has 18 members representing the following countries: Algeria (two), Argentina (one), Finland (one), Germany (one), Iran (two), Italy (one), Japan (one), Korea (two), Norway (one), Pakistan (two), Spain (two), Ukraine (one) and USA (one).

The Group has finalised the structure of its report as follows:

- Definition: "What is the LNG spot market?" and "What is the role of spot cargo in the LNG market?";
- Data: statistical approach;
- Analysis;
- Market changes;
- Physical constraint: value chain, liquefaction, shipping, re-gasification; and
- Contractual changes: former, current, flexibility, price formula etc.

During the Nordwijkerhout meeting each member gave a presentation on role play and it was decided to meet again in Seoul (Korea) in July. However, this meeting was later cancelled and instead the designated job leaders submitted papers to the Chairman.

The draft of the final report will be reviewed at the meeting to be held in Hammerfest in October.

Other activities

PGC D liaises with three LNG conferences and 12 LNG organisations as well as within IGU. These activities are coordinated by the Chairman. As regards the conferences he is aided by three members (from Algeria, The Netherlands and USA). More work needs to be done in this area, although PGC D was due to take part in the 18th World Petroleum Congress, Johannesburg, September 26-30.

As regards the organisations the Chairman is aided by nine members from Algeria, France, Germany, Italy, Korea, The Netherlands, Norway, UK and USA. Contacts have been made with EASEE-gas, GIE, GIIGNL and SIGTTO, and a meeting was held in Paris on May 18 with GIIGNL, Gas Transmission Europe and SIGTTO.

Cooperation within IGU is handled by Mr Lopez-Zurita (Spain), who liaises with the R&D Task Force, Mr Ingrain (France), who liaises with WOC

5, and Mr Ebels (The Netherlands), who liaises with PGC B. At Nordwijkerhout a joint meeting was held between PGC D and PGC B where each Committee gave a presentation and then exchanged ideas concerning improvements of common activities.

PGC D also has a New Actors Group, which is led by Mr Jean-Marc Hosanski (France). Contacts have been re-established with several gas associations and companies representing LNG importing and exporting countries to ask them to join our Committee as soon as possible. In particular, Brunei, Egypt, Nigeria and Oman have been approached, but so far without success.

PGC D report

The PGC D Vice Chairman is responsible for preparing the Committee's report giving an overview of the LNG industry and marketing from 2002 to 2004. The summary of the report, the preliminary data and the final schedule for its preparation were presented at the Nordwijkerhout meeting. The draft of the report will be presented at the Hammerfest meeting in October.

WGC2006

During the last PGC D meeting at Nordwijkerhout the members of the committee to select the papers for PGC D's contribution to WGC2006 were designated as follows: J. M. Hosanski, M. Al-Issa, R. Klein Nagelvoort, Y. Bramoulle, Dr A. Acton, E. Noguchi, B. Larsen, M. Tandjaoui, M. Amsyari and F. Arabi. The draft PGC D contents for the handbook were reviewed and PGC D's programme for WGC2006 was reviewed and approved. It comprises:

- *Session 1: Tuesday June 6, 15:30-17:30*
  LNG: an industry with a high growth rate / the growth of LNG demand: reality and challenges
  Chairman: J. M. Hosanski, Vice Chairman: M. Al-Issa
  During this session the PGC D and SG D.3 reports will be presented
- *Session 2: Thursday June 8, 10:00-12:00*
  40 years, the age of maturity for the LNG industry, what role for the aging facilities?
  Chairman: Dr A. Acton, Vice Chairman: E. Noguchi
- *Expert forum 1: Wednesday June 7, 10:00-12:00*
  Technical and economical aspects of the LNG industry
  Chairman: R. Klein Nagelvoort, Vice Chairman: Y. Bramoulle
  During this session the SG D.1 report will be presented
- *Expert forum 2: Wednesday June 7, 15:30-17:30*
  Safety and technology developments in LNG terminals, vessels and installations
  Chairman: B. Larsen, Vice Chairman: M. Tandjaoui or M. Amsyari
  During this session the SG D.2 report will be presented
- *Strategic panel: Thursday June 8, 15:30-17:30*
  Will the LNG industry respond to the challenges?
  Chairman: A. Hached
  The final contents for the handbook were submitted to the CC Secretary at the end of April.

Papers presented

Various papers have been presented by PGC D members on LNG issues at a number of conferences held during the first half of 2005 including:

- LNG Growth in North America, January, Calgary, Canada;
- INDOGAS 2005, January, Jakarta, Indonesia;
- FLAMME 2005, February, Amsterdam, The Netherlands;
- GASTECH 2005, March, Bilbao, Spain;
- Energy and Gas 2005, April, Perth, Australia;
- IGU LNG workshop, April, Amsterdam, The Netherlands (PGC D chaired this);
- LNG Supplies for Asian Markets, May, Singapore; and
- 2005 IEA/GTE workshop, May, Paris, France.

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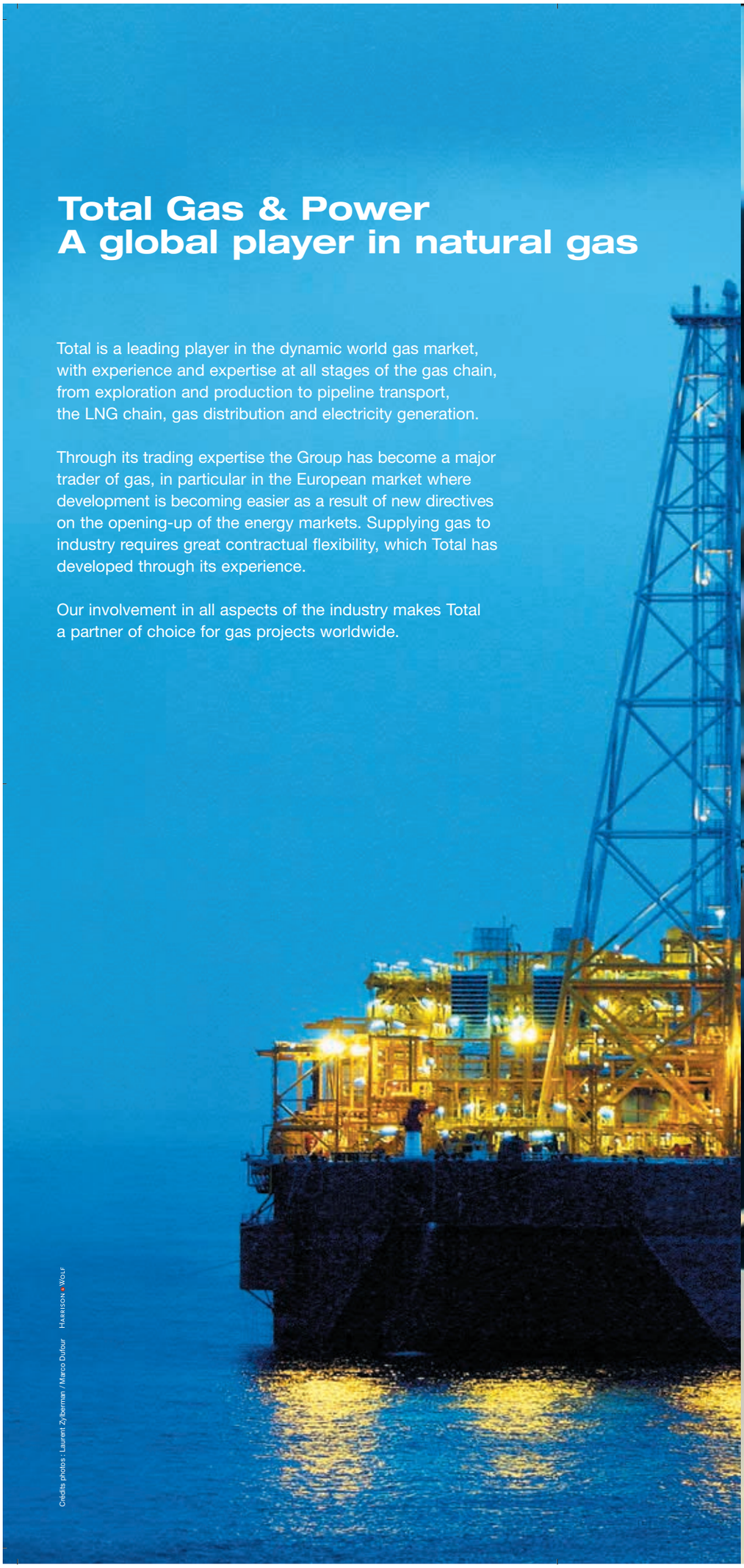

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TOTAL

Progress Reports from the Task Forces and Special Projects

This chapter contains information from IGU's two Task Forces and three Special Projects.

Task Force Research and Development

The R&D Task Force met on April 19 in Noordwijkerhout, The Netherlands, in connection with the joint meeting. Dr Bob Harris officially took over the chairmanship, following the departure of the former Chairman Dr Roy Bilbé. The Task Force agreed on an R&D questionnaire that will help IGU to assess the current situation of R&D in the gas chain. This questionnaire was due to be posted to members of IGU in September. The Task Force also suggested a number of panellists and the set-up for two strategic panels at WGC2006 that it is assisting the CC in preparing. These panels will cover R&D and other fuels. The next meeting of the Task Force will be held in November in Copenhagen.

Seung-hwan Lee, ICT2005 NOC Chairman addresses the welcome reception.

Task Force Information and Communication Technology

As also reported in "From the Secretariat" (see *pages 28-29*), ICT2005 was a great success. Held in Busan, South Korea, May 23-25, the congress started with a bang, literally – the enthralling sound of the drums of the Korean National Orchestra, accompanying singers and dancers in a show of traditional Korean culture during the opening ceremony. This highly professional show set the scene for a successful congress. More than 500 delegates from 37 countries came to hear world energy and IT industry leaders from Asia, North America and Europe give their views on "Value Creation with ICT in Energy Companies", to see these leaders in discussion in the CEO forum, and to learn from the 50 or more papers given by specialists from across the world on a vast range of topics, from outsourcing and the second wave of customer relationship management (CRM), to pipeline integrity management and hybrid smart cards.

The keynote speeches were of particular interest for such a global audience. IGU President George Verberg opened the congress by stressing the growing importance of gas in the world energy mix. Jong-Yong Yoon, Vice Chairman & CEO of Samsung Electronics, gave an overview of the situation in Asia, while Clive Mather, CEO Shell Canada, and Henk Dijkgraaf, CEO Gasunie, gave overviews of the situations in their respective countries: the Dutch experience of deregulation as presented by Mr Dijkgraaf was of great interest to those regions in which deregulation is still in the development phase. Andrew Bartels, Vice President and Research Analyst of Forrester Research, and Anatole Gershman, Partner & Director of Research,

Accenture Technology Labs, both presented their views on the IT market and future developments, Mr Gershman focusing on the concept of ubiquitous computing.

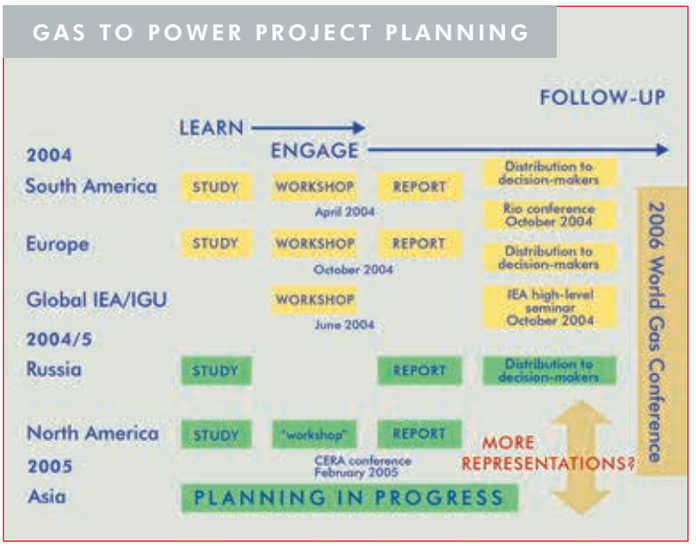
Furthermore, the CEO forum raised the important matter of ICT decision-making at board level and the role of the CIO in facilitating this process: one member of the panel even admitted to having his eyes opened to the broad spectrum and sheer depth of ICT by the ICT2005! It was clear that decisions on such large-scale investment programmes as seen in ICT cannot be taken lightly or without sufficient knowledge, and all members of the forum agreed that this remains an important issue.

All in all, we can look back on three very successful days, in which new contacts were made, old ones renewed and many, many high-quality papers presented. It was a long trip to South Korea, but well worth it – and not only for the drums.

Special Project Gas to Power

Taking into account the pivotal role of the power sector for the future development of natural gas markets, IGU launched the Special Project Gas to Power (GTP) in order to come to a better understanding of the future role that natural gas can play in power generation. Through a series of surveys and workshops the critical issues influencing the role of natural gas for power generation are being analysed. The project focuses on the views of governments, the electricity industry and the gas industry with respect to GTP and ways to tackle possible problems arising from different points of view among the stakeholders. *Figure 1* gives an overview of the project planning.

The first workshop, addressing the South American market, was held in cooperation with WEC and IEA in Rio de Janeiro on April 29, 2004. A workshop focusing on Europe was held on October 4, 2004 in Brussels, followed on October 22 by a high-level conference in Paris. The latter was organised by IEA and both IGU President George Verberg and GTP Project Adviser Dick de Jong participated.



ABOVE
Figure 1.

A report on the European situation has been prepared by Senior Analyst Christoff Toenjes of the Clingendael Institute in The Hague. The North American GTP situation was reported by Terry Thorn (former Chairman of IGU Working Committee 9) and discussed during a workshop alongside a week of events organised by Cambridge Energy Research Associates (CERA) in Houston in February. The final reports are now available.

The low capital costs and high conversion efficiencies of combined-cycle gas turbine (CCGT) power plants are the driving forces behind the projected strong global growth of demand for natural gas. Many forecasts expect natural gas to be the fossil fuel showing the highest growth rates. Recently, however, there has been increasing scepticism about its prospects. This is due to high natural gas prices, caused by insufficient supplies (North America) or the price linkage to the oil market (Europe, Asia-Pacific), and the increasing acknowledgement that the natural gas industry will have to meet large investment challenges. Major forecasting agencies, such as IEA and the US

REGULATORY FRAMEWORK AND THE MARKET

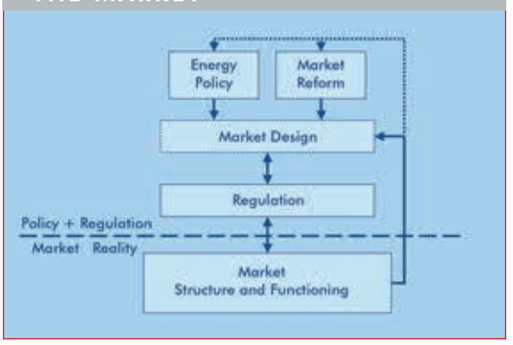


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Figure 2.

Energy Information Administration (EIA) have repeatedly revised their gas demand forecasts slightly downwards, in particular for North America and Europe, and in recent years coal has been growing at a much faster rate than natural gas.

IGU has started to look deeper into this increasing scepticism in a series of workshops. Not surprisingly, gas and electricity companies state two main criteria for the successful large-scale use of natural gas in power generation: gas needs to be reliably available at prices which make it competitive with other forms of generation, and to ensure this, the regulation of energy markets needs to be as stable, transparent and predictable as possible.

However, the first stages of the project have shown that while the principal criteria look alike, the main issues hampering the use of natural gas in power generation are different in the various regions of the world.

VALUE CHAIN ACROSS BORDERS *(MARKET POWER)*

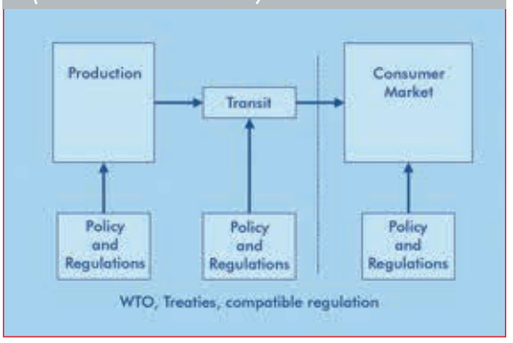

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Figure 3.

Special Project Regulation

The regulatory conditions necessary for gas markets to foster growth are highly dependent on a market's development phase, its structure, its functioning and its import dependency. Preliminary research using sources including literature, the recent IGU gas to power workshops and the opinions of experts, makes it clear that a regulatory framework requires a balanced approach based on a realistic analysis of actual market conditions and the objectives that can be achieved. This is often called "market design" (see *Figures 2 and 3*).

Further study by the Clingendael Institute in The Hague will analyse in detail the need for adaptive regulation and outline the choices to be made. The findings will be presented as an input for the strategic panel on market conditions at the World Gas Conference in 2006 in Amsterdam. Contacts will be made with the University of Florence and the US Federal Energy Regulatory Commission (FERC) to gather further input. A high-level workshop is planned to report and discuss the preliminary results as a run up to the conference.

For the purposes of this study a regulatory framework is defined in a broader sense and not simply as regards the responsibility and available instruments of the "energy regulator". The impact of the full regulatory framework needs to be taken into account in assessing its impact on the investment climate. This can be a combination of the roles and allocated responsibilities not only of the regulator, but also of the government, the ministry, the competition authority, the financial regulator, a licence agency etc. A framework's instruments can target different parts of the gas chain. In the case of cross-border dependencies there are also supranational regulatory aspects involved.

Natural Gas

National energy asset

Natural gas is being used at an ever faster pace in everyday life. Together with DEPA, multinational companies are investing in the natural gas networks of Greek cities.

ΔΕΠΑ
ΔΗΜΟΣΙΑ ΕΠΙΧΕΙΡΗΣΗ ΑΕΡΙΟΥ Α.Ε.

DEPA SA: Public Gas Corporation of Greece

207 Messoghion Ave., 11525 Athens, Greece
Tel.: +30 210 67 93 500, Fax: +30 210 67 49 504, email: pr@depa.gr

Special Project Sustainability

One of the main aims of this Special Project is to present to IGU and its members recommendations for the follow-up of the "Guiding Principles for Sustainable Development" adopted in 2003. Professors Catrinus Jepma and Nebojša Nakićenović have been asked to prepare a report on the "Future role of Natural Gas and its Strategic Impact for IGU".

A first zero order draft of the report has been discussed with IGU representatives, IGU members and external stakeholders in Buenos Aires in December 2004. The meeting was organised in cooperation with PGC A and was hosted by the delegation of Argentina.

The report of Jepma and Nakićenović will reflect the flux in energy markets and picture future developments in a couple of story-lines. These story-lines will emphasise the main themes for the gas industry, namely the issues of security of supply, market structure, market share and transition. Based on the story-lines the impact for the position of natural gas – with a special focus on sustainable development – will be analysed followed by a set of recommendations to IGU. Story-lines were chosen in preference to scenarios because of the opportunities to concentrate on major themes and illustrate potential structural changes. The next version of the report will be discussed during a workshop in October in Groningen. This will be followed by a workshop in early 2006 in Vienna.

The report will include "boxes" that describe major options for the gas industry to cope with sustainable development. It has been established that these options have quite different natures and range from short-term and highly-efficient to long-term and high-cost. A key example of the first type is improving energy efficiency, while a key example of the second type is the change-over to a hydrogen-economy. Within the whole range special attention will be paid to the further penetration of natural gas in the transportation sector, the trend in Europe and Japan towards decentralisation of the energy infrastructure, the introduction of clean gas and CO_2 sequestration (clean fossil fuels). The "boxes" will be developed in close cooperation with the relevant Working Committees.

NGVs

We will work together with IANGV to look at the role of natural gas in the transportation sector. The key issues are the contribution of natural gas as a transportation fuel to the improvement of local climate conditions, especially in mega-cities and urban areas, and the time frame for a further penetration in this market segment. To define the time frame major conditions will be ranked and interaction with the application of biogas will be taken into account.

Decentralised electricity production

To describe the impact of a further decentralisation of the energy infrastructure for natural gas, a group of experts has been asked to prepare a working document that describes the economic and technological concepts, to reflect on the experience so far and to indicate the way forward. As a decentralised energy infrastructure is based on the integrated and local production of heat, electricity and cooling, a market-scan for energy demand will also be presented. To conclude the working document the group will analyse the potential for small-scale renewable energies (wind, solar, bio) in a decentralised energy infrastructure.

The presentation of the "boxes" and the working document on decentralised energy infrastructure will be included in the Groningen workshop. We are looking forward to a further fruitful discussion in this workshop and invite interested experts.

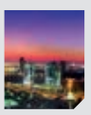
Bridging to the Future (Sustainable Urban System Design)

The follow-up to the Sustainable Urban System Design (SUSD) competition of the 2000-2003 Triennium takes the form of an international collaborative project called "Bridging to the

Qatargas The World's Leading Supplier of LNG...

Qatar Liquefied Gas Company Limited - or Qatargas, for short - pioneered the LNG business in Qatar. The company was established to own and operate a world-class onshore LNG plant, utilizing natural gas from the North Field, and to market and export LNG and associated condensate worldwide. Discovered in 1971, the North Field - the world's biggest natural gas field - contains more than 900 trillion cubic feet of gas. This huge field has enabled Qatar to become one of the world's major exporters of liquefied natural gas - LNG.


Customer Satisfaction


Profitability


Efficiency & Reliability


High Safety, Health & Environmental Standards


High Caliber Workforce

Vision Statement

Our vision is to be the world's leading supplier of LNG and condensate – as measured by customer satisfaction; profitability; efficient and reliable operations; high standards of safety, health and environmental compatibility; and maintenance of a diverse workforce of the highest caliber.

To be the world's leading supplier of LNG...

قطر للغاز
QATARGAS
www.qatargas.com

Future". It aims for a vision of integrated urban and energy planning to manage the difficult transition to sustainable energy systems with a time horizon of 30 years.

The intended output for WGC2006 includes:

- Finding energy pathways for a number of urban regions covering a range of climates, cultures and continents;
- Establishing a method for integrated long-term energy planning that is transferable, field tested and collaborative;
- Operating a website that functions as a clearing-house for energy knowledge and providing tools for urban utilities and urban planners; and
- Proposing demonstration projects in each urban region consistent with the new pathways.

Over the last couple of months we have organised start-up workshops in each of the participating regions: Canada, China, India and The Netherlands. These workshops brought together the CONSENSUS Institute, IGU, the local teams and sometimes also representatives from the other teams. CONSENSUS is coordinating the contributions of the various teams and is led by Sebastian Moffatt, leader of the winning Canadian team of the Japanese SUSD contest. The core project plan has been discussed and evaluated in the various workshops. Everyone has agreed with the key themes of the project:

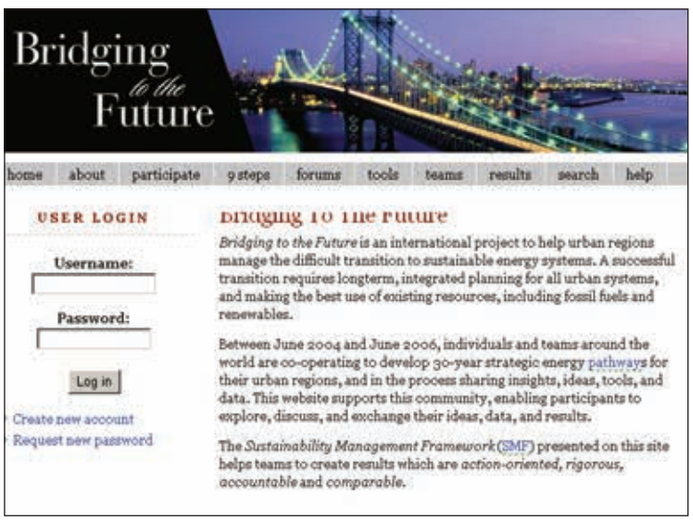
- Integration of energy planning into all urban long-range plans;
- Staging the transition to sustainability using natural gas as a bridging fuel;
- Designing resilient energy systems;
- Proposing pilot projects for the next phase of work; and
- Involving the local government and academics in the planning process.

Each team has suggested improvements and new tools. As a result, changes have been made to the core project plan. The changes will simplify the work, add some important analytical content (for example on macro economics), and improve the visualisation products. The website (www.bridgingtothefuture.org) is being revised to reflect these changes to the core project plan.

The collaborative process has already proved to be very valuable. We now want to continue this learning and sharing, and to meet together in workshops as a group of teams on other occasions, before the conference in 2006.

The collaboration will also allow us to compare results in a number of ways. For example, we will all calculate a core set of energy indicators for our cities, using the same calculation method and the same presentation graphs. This is unique. We will produce some visual results that will allow us to present our results together, both at the conference and on a common website. We will even be presenting some of the conclusions jointly as an international team at the WGC2006, instead of as a series of presentations by separate teams.

This is a very interesting and promising way of enhancing knowledge for the energy industry about urban planning, and for the urban sector about energy planning.



For more information on SP Sustainability's follow-up to the SUSD competition see www.bridgingtothefuture.org.

How many things in the world cannot be improved?

Instances of perfection are few and far between.

Regardless of how good something may appear, a closer examination can reveal that a change, however slight, can have quite an impact.

Competitive pressures demand us all to seek constant improvements and this is at the heart of the technology and consultancy services we offer.

If you'd like to explore the potential improvements that our global operating experience could bring to your business, let's talk.

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Annex

Milestones and deliverables

Progress reports

- 2005 second half year December 31, 2005
- 2006 first half year May 1, 2006

Papers and reports

- *November 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 CC each Committee has to prepare a 10-minute PowerPoint presentation on the progress of its work. This should be available on the Collaboration Portal one week before the meeting date, together with a short (one A4 page) progress report.

- *March 3, 2006*
  Deadline for March meeting Presentations for the World Gas Conference 2006 must be handed in at the authors' room the day before the session date at the latest.

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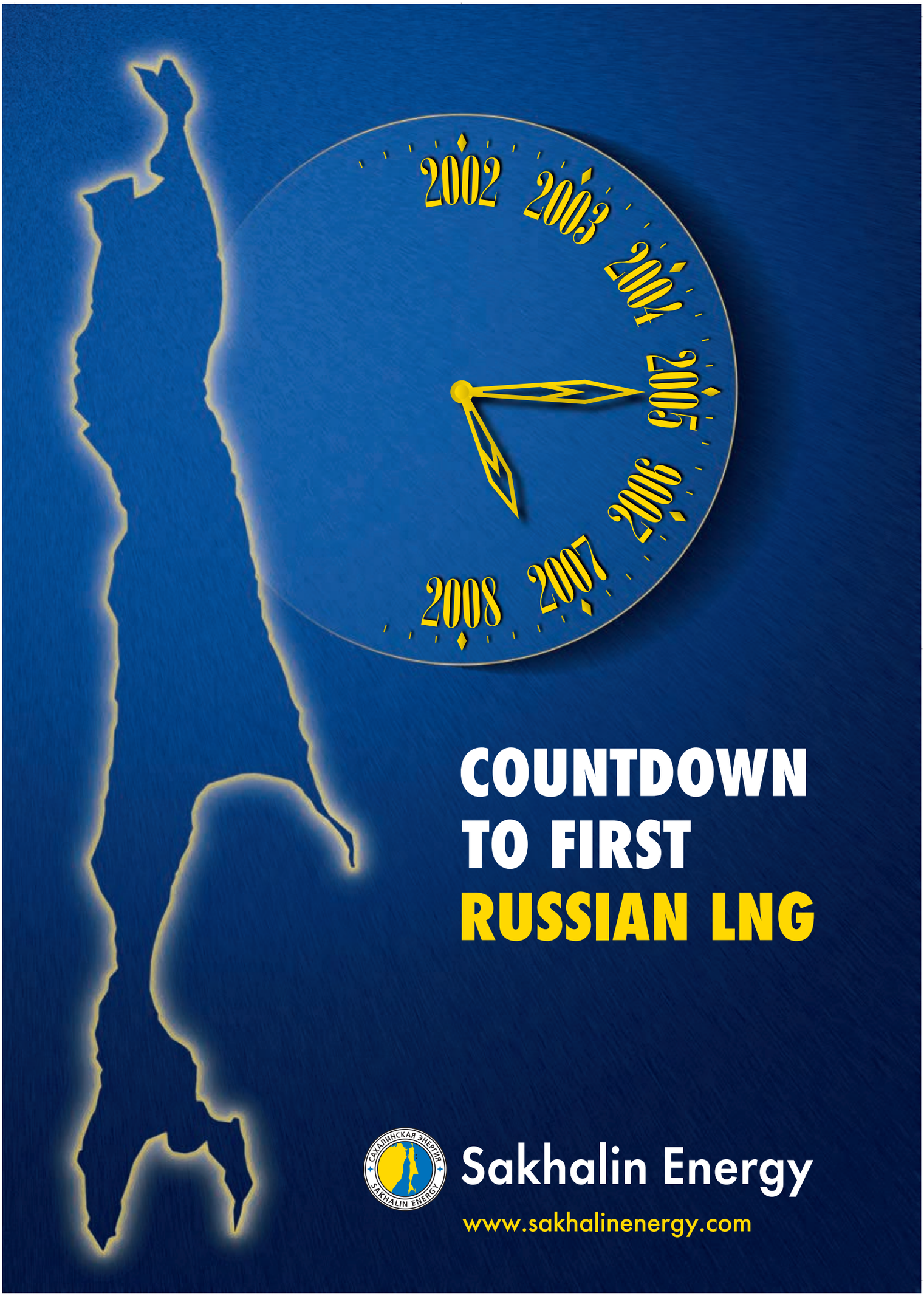

FEATURES

This issue's feature section contains a report on the race to exploit gas resources around the world, an update on methane hydrates, an overview of the role of natural gas in China – the host of this year's Council meeting, an article on managing pipeline integrity from Working Committees 3 and 4 and a report on the gas industry in the Slovak Republic. We round up with a description of the publications and documents available from IGU and the events calendar.

ConocoPhillips… the experience and proven performance to meet all your LNG needs.

Across the value chain, ConocoPhillips knows natural gas and LNG.

Today's world is facing increasing energy demand, and specifically for clean-burning natural gas. The International Energy Agency predicts the world need for natural gas will nearly double between now and 2030. With much of the world's gas far from the marketplace, increased use of LNG will be required to meet future needs.

For more than 40 years, ConocoPhillips' passion for innovation and commitment to performance has been delivering proven LNG solutions to customers around the world in a safe, environmentally-friendly manner.

Put our experience to work for you.

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The LNG experience to do the job right

ConocoPhillips is a global leader in liquefied natural gas (LNG) with more than four decades of innovative initiatives such as building the first LNG carrier used for international trade and the first commercially successful liquefaction facility.

ConocoPhillips' MV *Methane Pioneer*, a converted WWII cargo ship, began the transoceanic transportation of LNG when it carried its first cargo from Lake Charles, Louisiana, to Canvey Island in the United Kingdom in 1959.

The MV *Methane Pioneer*, the world's first transoceanic LNG carrier.

Ten years later, ConocoPhillips commenced LNG liquefaction operations at its pioneering facility in Kenai, Alaska. Using *ConocoPhillips LNG℠ Process* liquefaction technology (formerly known in the LNG industry as the Phillips Optimized Cascade LNG Process), Kenai has continuously operated as an industry-leading, safe, efficient and reliable LNG plant.

Today, in conjunction with its Global LNG Collaboration partner, Bechtel, ConocoPhillips has licensed its proprietary ConocoPhillips LNG Process to operators in three continents including the Atlantic Trains in Trinidad, the Darwin Train in Australia, the Egyptian LNG Trains and the Equatorial Guinea Train beginning service in 2007.

Kenai, Alaska, is home to one of the oldest continuously operating LNG plants.

With worldwide demand for natural gas growing at unprecedented levels, the ConocoPhillips LNG Process provides cost-competitive solutions to bring natural gas from areas far from the marketplace. Companies and governments can license ConocoPhillips' technology to take advantage of their reserves of natural gas and transport it efficiently to energy-hungry markets.

LNG Collaboration: the teamwork of two proven performers, ConocoPhillips and Bechtel, delivers the results you want

ConocoPhillips' natural gas liquefaction facility in Kenai, Alaska, is one of the oldest, continuously operating LNG plants in the world and still serves as an industry role model for safe, efficient and reliable operations.

Bechtel's global engineering, procurement, construction and project management experience spans more than a century of complex projects in challenging locations, including engineering and constructing more than one-third of the world's LNG production plants.

The two companies established the Global LNG Collaboration in 1996 to ensure these traits are built into each LNG plant built using the proprietary ConocoPhillips LNG Process, available under license to operators around the world. The Global LNG Collaboration combines ConocoPhillips' LNG technology and expertise with Bechtel's world-class know-how in designing and executing LNG projects to establish new standards for construction and operation.

To date, the collaboration has cooperated on LNG liquefaction projects in operation or construction in Trinidad, Egypt, Australia, and Equatorial Guinea. Studies and FEEDs are underway for additional proposed liquefaction projects throughout the world.

Two main features ensure that the ConocoPhillips-Bechtel LNG Collaboration product is the right one for you:

Atlantic LNG
Atlantic set the bench-mark for project cost and schedule performance.

Egyptian LNG
Egyptian LNG Train 1 delivered its first LNG cargo in 2005, three months ahead of schedule.

Darwin LNG
ConocoPhillips was the first to use gas turbines in an LNG facility and Darwin LNG is the first to use aero-derivative gas turbines.

Equatorial Guinea
Train 1 is scheduled to commence shipping LNG in late 2007, establishing a record-setting pace from project inception to first LNG delivery.

The right liquefaction process:

Reliability

The ConocoPhillips LNG Process is designed around a "two-trains-in-one" reliability concept. Each liquefaction train is served by two parallel driver-compressors. Downtime of any compressor or driver does not result in total loss of production from the train. In more than 36 years of operation, Kenai has never missed a product shipment, recording plant availability in excess of 95 per cent and refrigeration gas turbine reliability in excess of 99 per cent.

High thermal efficiency

Thermal efficiency and greenhouse emissions were significant considerations during the development of Darwin LNG. By using efficient aero-derivative turbines, combined with waste heat recovery and additional ship vapour recovery equipment, this plant sets a new standard for high efficiency LNG production.

Ease of start-up, shutdown and operational flexibility

The ConocoPhillips LNG Process is based on simple and reliable gas plant designs. It uses pure component refrigerants configured in a three-stage cascade. Refrigerants are retained to allow easy start-up and cool-down of a plant from ambient temperature and rapid restart from cryogenic conditions. It also provides excellent flexibility to meet diverse operating conditions and demand. Stable operations can be achieved at liquefaction rates as low as 10 per cent of design capacity.

Certainty of outcome:

Low capital cost and short project schedules

Throughout their collaboration, ConocoPhillips and Bechtel have established new benchmarks for competitive capital and operating costs, and optimal project schedules to deliver the results you need.

Industry confidence from proven performance

LNG facilities and sales contracts are valued in the billions of dollars. Financiers, producers and buyers know that the ConocoPhillips-Bechtel LNG Collaboration product is a proven performer.

Continuous improvement

ConocoPhillips and Bechtel are focused on remaining competitive in technology performance, schedule, cost and client satisfaction. Joint efforts range from incorporating technical innovations in the liquefaction process to all aspects of LNG project execution. The collaboration strives to reduce the total cost of plant ownership while enhancing the overall commerciality of an LNG facility.

ConocoPhillips BECHTEL

Global LNG Collaboration

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ConocoPhillips and Bechtel team up to deliver proven technology... time and time again.

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The World Race for Gas Resources

By Terence H. Thorn

Forecasters have long predicted that natural gas would become the fastest growing primary energy source in the world. Today, against a backdrop of escalating prices and a scramble to secure energy resources, industrialised countries have joined the developing world in the search for natural gas supplies. Consumption is expected to increase by nearly 70% during the first two decades of this century.

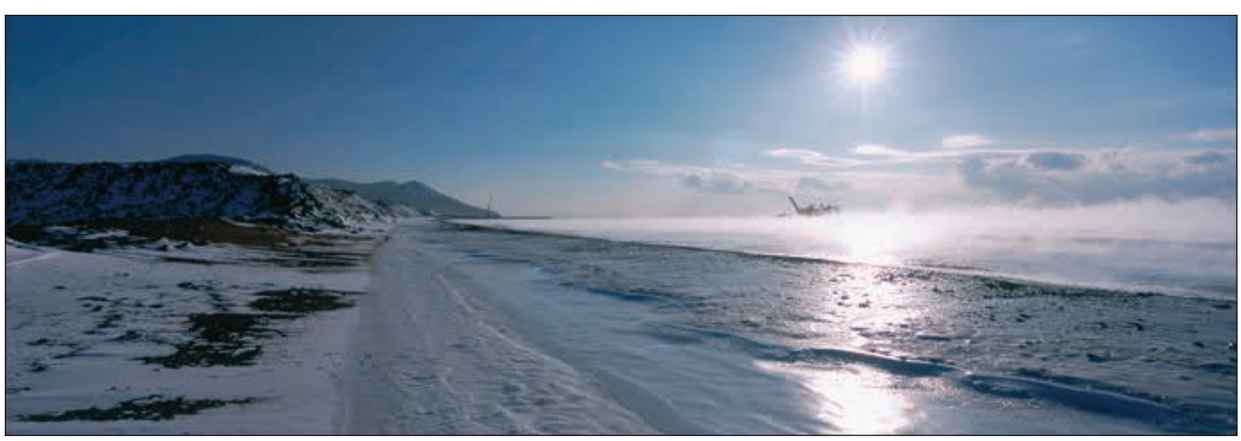
At the end of 2004 worldwide proved gas reserves were 6337 tcf (179.5 tcm) and the main challenge of increasing natural gas use is extracting and delivering supplies to consumers. To accomplish this goal a number of international pipelines are either planned or already under construction, while liquefaction capacity and LNG tanker fleets are being increased. Lloyd's Register estimates that a total of 57 ships are currently on order in the major shipyards. With global capacity estimated at 28 ships a year, orders for new ships must now be placed two to three years in advance. Truly a tsunami of LNG will be hitting the shores of Europe, Asia and North America.

But this dynamic shift in energy markets will occur at a time of sustained higher energy costs that could drag the slowing US and other world economies into a serious downturn. Economists wonder if demand is sustainable at these prices, while energy traders worry how a disruption in supply could lead to shortages and even higher prices. New orders for plant and equipment are creating a backlog of orders, delays and higher costs. The costs of new projects are soaring. Waves of new orders are inflating the price of everything from steel to drilling rigs.

After attracting billions of dollars in investment to produce LNG, exporting countries Qatar, Iran, Malaysia, Nigeria and others have met to consider how to prevent a glut of fuel by the end of the decade. Others believe that the US and European markets will absorb all available LNG and predict a bidding war between the US, Europe and Asia for supplies that will double prices by the end of the decade.

North America

Historically Canada supplied the bulk of US imports and the United States supplied imports to



The race is on to exploit gas resources around the world from Sakhalin in Russia (ABOVE), where the Sakhalin II project is due to start LNG exports in 2008, to Qatar (OPPOSITE). In addition to its major LNG trade Qatar is due to start supplying gas to the UAE and Oman via the Dolphin pipeline project in 2006. A future link to Pakistan is proposed.

Mexico. That trade structure is expected to change as Canadian exports decrease and Mexico gains access to LNG imports from other regions reducing its dependence on the United States.

Natural gas demand has fallen from its high in 2000 as rising prices have hit the energy intensive industries hard. North American natural gas prices are the highest in the world and are expected to average $6.60/million btu in 2005 according to the Department of Energy's Energy Information Agency (EIA). One-fifth of the fertiliser capacity in the US and Canada has been shut down and over the past 12 years, the US chemicals industry has lost 178,000 jobs.

While higher natural gas wellhead prices have led to significant increases in drilling, this has not resulted in a significant increase in production. Instead, producers are drilling more and more wells just to maintain current levels of production, and the EIA predicts that the region's consumption will exceed its production by 2 tcf (56 bcm) in 2010. This gap between production and consumption is projected to triple by 2025. LNG imports will need to increase to bridge the gap and the industry is scrambling to build the necessary infrastructure.

Until 1995 almost all US LNG imports were from Algeria. More recently, shipments have also been received from Nigeria, the United Arab Emirates, Oman, Qatar, Malaysia, Australia and Trinidad and Tobago. While LNG may be the best near-term solution to provide new supplies of natural gas, there are sceptics. The US has a shortage of terminals to receive LNG. Would-be developers have identified some 50 North American sites, onshore and offshore, as potential spots for new LNG terminals in the US and Mexico. Planned expansions at the four existing terminals are underway, and four-to-six new LNG terminals are projected to be in operation between 2008 and 2010.

In Canada the latest assessment of the National Energy Board states that it is unlikely that future

production will be able to increase exports to the United States. Canadian gas production is likely to remain at best relatively flat through 2010. Canada will also consume more natural gas and is projected to have the highest gas demand growth in the region up to 2010 due to Kyoto Protocol commitments and the tripling of oil sands development by the end of the decade. As natural gas is one of the fuels used in producing oil sands, such a dramatic increase will divert significant amounts of gas from the US market.

Mexican gas demand will be driven by electricity generation and will increase 10% a year for the foreseeable future. The projected growth in demand is primarily to fuel natural gas combined-cycle electricity generation but, as infrastructure to serve residential and commercial users continues to grow, requirements for natural gas in all sectors are growing.

Since 1998 domestic production has been flat. According to the Mexican government, only 10% of the country's onshore resources and 4% of offshore

regions considered as having good potential have been explored. There has been no exploration in the deep offshore. Officials of the state company Pemex have estimated that as much as 200 tcf (5.6 tcm) of reserves lie deep in the Lankahausa and Kosni fields and plan to invest more than $200 million to begin development, but much more capital will be needed. Unfortunately Pemex does not have the budget to explore offshore and cannot provide these supplies. Institutional and ideological concerns have led to laws and regulations that blocked private capital and participation. Mexico thus faces an increasing dependence on imports, which are projected to grow from 7% in 2001 to 40% in 2025.

The Spanish energy giant Repsol YPF has proposed building an LNG terminal in the port city of Lazaro Cardenas – one of half a dozen such projects moving forward along Mexico's Pacific and Gulf coasts. Other LNG facilities have been proposed at Altamira on Mexico's Gulf coast and five facilities have been proposed in Baja California, Mexico, to serve both Mexican and US markets. The Mexican Energy Regulatory Commission has granted some of the required permits for the Altamira terminal and for three Baja California terminals – those proposed by Marathon Oil, Sempra Energy and Shell.

Central and South America

A decade ago governments in South America dreamed of an integrated natural gas transmission system which linked supplies and markets in Argentina, Chile, Bolivia, Peru and Brazil. Natural gas would be the fuel that powered South America and helped economically integrate the region. Today that dream remains unfulfilled. Despite having 4% of the world's proved natural gas reserves (250.6 tcf/7.1 tcm) and the potential to grow markets at an annual rate of 3.8%, financial and political turmoil have shattered plans for an integrated gas market.

Argentina continues to deal with its 2002 default on its sovereign debt which has hampered its ability to borrow for energy infrastructure projects. Although the country's economy has now almost fully recovered to pre-crisis levels, the natural gas sector, which is entirely privately held, continues to be affected by reduced consumer and investor confidence sparked by the 30% devaluation of the Argentine peso in 2002.

Despite having Latin America's third largest natural gas reserves, Argentina experienced an energy crisis in 2004. State-imposed price caps kept energy prices low and increased energy demand. The lower gas prices have discouraged natural gas producers in Argentina from increasing their output and from investing in new exploration and production activities. The government also arbitrarily reduced tariffs for the pipelines, which discouraged efforts to invest in additional pipeline transportation capacity to Argentina's load centres.

In order to make up for domestic shortages the government, in May 2004 and again in January 2005, broke an export contract with Chile and cut gas deliveries by 50%. Argentina is Chile's sole source of natural gas imports, and the continued supply disruptions have created considerable tension between the two countries. To prevent future crises, the Argentinian government initiated a set of energy sector reforms, including the establishment of a new, state-owned energy company (Enarsa), incentives for greater investment in downstream infrastructure and plans to eventually liberalise energy prices. While the government also pledged in May 2004 to increase investment in the country's natural gas sector to boost production and transport capacity, many question whether the country can raise capital and attract the necessary financing.

Chile has few indigenous energy resources other than hydropower and historically natural gas had played a small role in Chile's energy mix. However, in the early 1990s rising energy demand, air pollution concerns and a series of droughts prompted the Chilean government to revise its energy policy and encourage the greater use of

Demonstrators in La Paz call for a wider share of Bolivia's petroleum resources – "industrialise gas to generate jobs" reads the placard.

natural gas. In 1996 Chile hitched its energy fortunes to Argentina and began importing gas. Since then the share of natural gas in Chile's primary energy mix has increased substantially from 8% in 1996 to 29% in 2004.

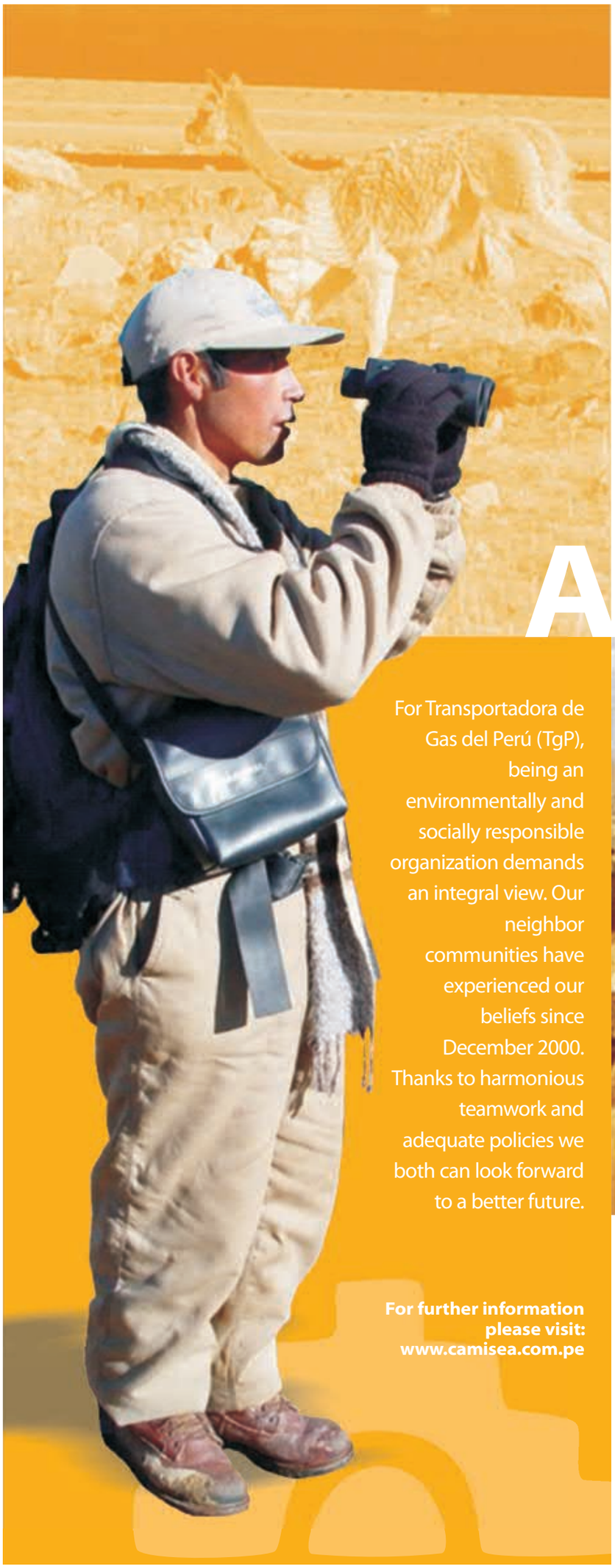
In the coming years it remains unclear when Argentina will be able to meet its supply obligations with Chile. Although Argentina has sufficient natural gas reserves to supply both its domestic market and Chile, the current natural gas supply problem stems mainly from booming demand for natural gas in Argentina after the government froze gas prices at artificially low levels in January 2002. The continuing crisis has forced Chile to look for a more permanent solution such as LNG from the Pacific markets and building new hydropower plants.

Whereas Chile is likely to join the international LNG market as an importer, Peru is set to become an exporter of natural gas as the Camisea project comes fully onstream. Hunt Oil, SK Corporation and Repsol YPF have signed a memorandum of understanding to develop the Peru LNG project, which involves the construction and operation of a liquefaction plant in Pampa Melchorita, 170 kilometres south of Lima. This is scheduled to be operational in 2009, although the project faces opposition on environmental grounds due to the proximity of the Paracas wildlife sanctuary.

Gas exports are also proposed via a pipeline that would connect Pisco, Arequipa and Tacna in Peru with Arica, Antofagasta and Tocopilla in Chile. Once the gas reached Chile, it could then be sent via existing pipelines to Argentina and Brazil.

After the Bolivian government privatised the country's hydrocarbon sector in the mid-1990s, investment from some the world's largest energy companies poured in and natural gas reserves increased exponentially. Officials began to describe Bolivia as the hub or heart of an integrated South American natural gas system. Export volumes to Brazil began in 1999, and plans to export LNG to the United States and Mexico via Chile or Peru were proposed.

In September 2003 a popular revolt broke out in response to the government's plan to move forward with the Chilean project. The revolt forced then-President Gonzalo Sánchez de Lozada out of power the following month. In July 2004 his successor, Carlos Mesa, held a referendum containing five questions on how Bolivia should exploit its natural gas reserves. The results of the referendum overwhelmingly supported the Mesa administration's plans to renationalise much of the country's hydrocarbon sector, to raise royalties on production up to 50% and to export natural gas through Peru instead of Chile. In October 2004, in the aftermath of the referendum, President Mesa sent the country's Congress a new hydrocarbons



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In the highlands of Peru, the local communities of Santa Rosa de Tambo, Ayaví and Huaytará are devoted to breed vicuñas and to shear and trade its precious wool.

Since the beginning of the Camisea Project we have worked closely with these communities, located along the pipeline route, developing strategies to protect vicuñas from illegal hunting as well as optimizing its care.

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bill that, if approved, would return all of Bolivia's hydrocarbon reserves to the state, increase royalties on projects and create a regulatory agency.

In May 2005 the Bolivian Congress passed a gas law which imposed a new 32% tax on production on top of the existing royalties of 18%. However, it fell short of the protesters' demands as they said it would be easy for the oil companies to evade the 32% tax. This set off another round of marches and road blockades. President Mesa resigned in June and Congress swore in the president of the Supreme Court, Eduardo Rodríguez, as a caretaker. New elections will be held in December.

As the second largest natural gas reserves on the continent remain in the ground and foreign energy companies look elsewhere to make their investments, many of Bolivia's trading partners have begun to look elsewhere for natural gas.

In Brazil the government has been trying to promote the use of natural gas in order to diversify the country's energy mix and the most significant development in reaching that goal was the construction of a 3000-kilometre Bolivia-to-Brazil pipeline, known as Gasbol. At the original signing of the contract in 1996, the supply volume was tied to Brazil building 16 natural-gas-fired power plants. Gasbol was completed in 1999.

However, neither the projected demand for natural gas nor the completion of the many power plants materialised due to the 1999 recession and the devaluation of the Brazilian real. The latter event caused huge currency exchange losses for the natural gas power producers who were required to pay for their gas supplies in dollars and sell power in reals. With natural gas demand low, for the past several years Brazil has been trying to renegotiate its take-or-pay contract with Bolivia to no avail.

The initial push for natural gas infrastructure by the previous administration was aimed at reducing Brazil's dependence on hydropower, after a drought in 2001 that led to electricity rationing and blackouts and contributed to Brazil's economic downturn. In 2003 the rain returned creating an energy surplus and the da Silva administration announced an initiative to meet the nation's growing electricity needs largely through expansion of hydroelectric capacity. However, at the end of 2003 the administration reversed its policy in the hope of stimulating demand for natural gas and ultimately reducing the financial exposure from the country's take-or-pay commitments with Bolivia. Petrobras offered local distributors in the states it serves discounts if they sold more natural gas than that for which they were originally contracted and is proceeding with a number of domestic pipeline expansion projects in the south-eastern and north-eastern regions of Brazil. Seismic studies and exploratory drilling efforts are also underway to see if domestic production can be expanded, although there are environmental hurdles as the prime prospects are in the Amazon jungle.

Despite these efforts, Brazil's natural gas market still faces some major hurdles, the largest of which is domestic demand. Petrobras is still importing only about half of the volumes prescribed in its take-or-pay contract with Bolivia and it is likely that only 10 of the planned 16 natural gas-fired power generation plants will ever be built. Without demand, it will be difficult to attract foreign investment to develop newly-found gas reserves. Petrobras's dominance of Brazil's natural gas sector might also discourage foreign investment, which is needed to help develop the country's natural gas infrastructure. Many obstacles to attracting international companies to Brazil's energy sector remain. These include lack of demand, an unclear regulatory regime and taxes, and unattractive licensing rounds.

Although Venezuela has the largest gas reserves in Latin America (149 tcf/4.22 tcm), it lacks adequate infrastructure to take full advantage of them. Production in 2004, all consumed domestically, was only slightly more than neighbouring Trinidad and Tobago, which has much smaller reserves