SG A3 Post-Kyoto concept

Leader: Klaus-Robert Kabelitz, E.ON Ruhrgas, Germany

Objective:

To evaluate long-term action on climate change and develop a framework for action once the Kyoto Protocol's first commitment period finishes in 2012 (a complete summary is available from the IGU website, under PGC A).

External relations

Through PGC A IGU is working actively with outside organisations related to sustainable development. So far there have been two main events.

On behalf of IGU, PGC A members Hyo-Sun Kim and Calliope Webber attended COP 12, which was held in Nairobi, Kenya, November 6-17, 2006.

The following month Klaus Kabelitz attended the fourth GROCC meeting in New York (December 18-19), where IGU endorsed the joint statement on "The Path to Climate Sustainability".

Future plans

Details of PGC A's meetings are shown in *Table 2* and at presstime the next meeting was due to be held in Norway, April 18-20. Possible hosts for subsequent meetings during the Triennium include Pakistan, the Slovak Republic and the UK.

● Programme Committee B – Strategy, Economics and Regulation

The conclusions of PGC B in the 2003-2006 Triennium threw light on many important issues but also raised questions on matters the gas industry had usually taken for granted.

The world is not running out of gas, we said, but it is no longer so clear that gas demand can maintain the buoyant rates of growth predicted so far. Neither is it clear that natural gas will remain the fuel of choice for power generation. In other words, there may not be security of demand in the long run if high gas prices and price volatility persist.

The traditional confidence in the ability of the gas industry to supply a continuous flow of gas to the market may be questioned. Will gas companies be able to afford the necessary investment once margins in national markets have been curtailed due to competition and business unbundling? What kind of cooperation agreements between producers and consumers will better suit the new needs of the markets and industry in the long term?

PGC B's challenge is to try and answer these questions. The Committee will focus on the most

RIGHT
Table 2.

PGC A MEETINGS

Meeting	*Dates*	*City/ Country*	*Host*
#1	Sep 26-28 2006	Barcelona, Spain	Juan Puertas, Gas Natural
#2	Apr 18-20 2007	Haugesund, Norway	Knut Barland, Statoil
#3	Sep 19-20 2007	The Netherlands **Not confirmed**	(Nuon Technology, Elbert Huijzer)
4#	Feb 27-28 2008	Korea **Not confirmed**	(KOGAS/Korea Gas Union, Hyo-Sun Kim/Seung-Min Park)
5#	Sep 24-25 2008		
6#	March 25-26 2009		
7#	Sep 26-28 2009		

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sensitive issues such as the new drivers for supply and demand, the key role of gas prices and the kind of company structures that best fit the new business environment in different parts of the world.

The Argentine Presidency has established "The Global Energy Challenge: Reviewing the Strategies for Natural Gas towards 2030" as the first Strategic Guideline of the 2006-2009 Triennium. PGC B will act as one of the key custodians of this Guideline and concentrate on a scenario analysis. Not only is the time frame to 2030 one during which a lot can be done on infrastructure and at the policy level, but it is also a period when major energy shifts are possible and where IGU's policy recommendations should have more impact.

PGC B will carry out its work through three Study Groups: Supply and demand to 2030 (B.1); Gas price formations and trends (B.2); and Regulation and future industry structure (B.3).

Membership and first meeting

PGC B's first plenary meeting was held in Toledo, Spain, November 19-21, 2006. It was attended by 47 of the then 94 members. Despite the reasonable worldwide coverage already achieved, delegates decided to extend invitations to members of specific markets to obtain a full industry representation in each Study Group. As a result, membership has since risen to 100.

Given such a large number of members and the complexity of relations with other projects, a strong management team is required. The organisational structure of PGC B aims to deal with this need by adding a staff position to the Chairs and by reinforcing the leadership of the Study Groups (see *Figure 2*).

The meeting dealt with the following business:

- Presenting the overall objectives of PGC B and the proposed working methodology.
- Explaining the broad guidelines for the *2030 Natural Gas Industry Outlook* study.
- Approving the organisation chart of PGC B.
- Presenting the scope and objectives of each SG.
- Introducing all delegates and deciding who would participate in each SG.
- Working out the specific tasks of the SGs and assigning responsibilities.
- Setting the dates and objectives for the next meetings of the SGs.
- Arrangements for the next plenary in Washington DC, September 26-27.

A very useful roundtable session was organised to conclude the meeting at which delegates confirmed their commitment with the objectives discussed; some of them proposed other colleagues to reach a full coverage of themes and regions and all of them invited the Chairs to keep contacts with non attending delegates to get them fully involved in the shared objectives.

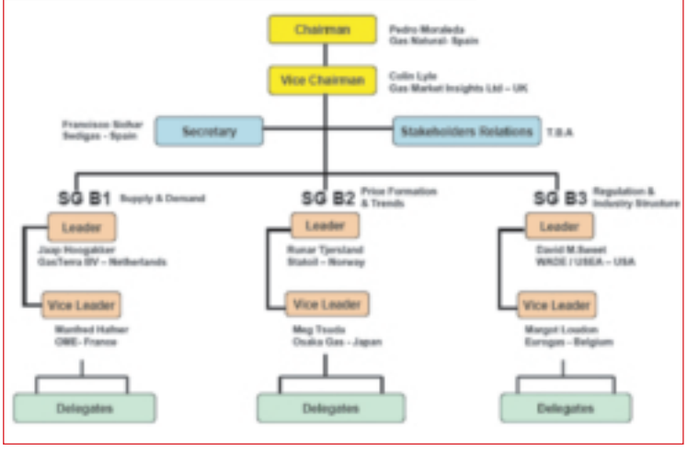
The terms of reference of PGC B's three Study Groups and action agreed to date can be summarised as follows:

SG B.1 Supply and demand to 2030

- Selection of world regions and the most credited entities providing estimates in order to analyse and compare them with our own estimates.
- Definition of the major supply and demand drivers and their potential impact in the medium and long terms.

BELOW
Figure 2.

PGC B ORGANISATION CHART



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A schedule was agreed for actions to be implemented and information exchanged prior to the second meeting of the Study Group in Paris on April 19.

SG B.2 Gas price formations and trends

- Definition of the prices which will be the object of this study: wholesale price formation.
- Analysing gas pricing principles: gas to gas competition, market value price, indexation to competing fuels, cost plus, etc.
- The main gas price drivers and their impact in different gas regions and time frames.

The purpose is to find out what the industry can do to ensure that gas remains competitive for consumers and an attractive business for producers.

At presstime, and prior to the Study Group's second meeting in Paris on April 19, SG B.2 was planning to publish a report on price regimes and volumes by region. It was also planning to issue three papers dealing with the prices to focus on, the volatility of gas prices and the current indexation of pipeline gas and LNG.

SG B.3 Regulation and future industry structure

Members of SG B.3 have decided to set up three Task Forces to tackle their topics:

- Harmonisation: to analyse how regulation and voluntary agreements can facilitate the globalisation of natural gas markets and reduce the costs of cross-border operations. This Task Force will compare and contrast standardisation efforts currently underway in some markets.
- Future industry structure: how key drivers such as unbundling, the new relationship between gas and power generation, investment requirements and environmental regulation will change the industry structure and the roles in the value chain.
- Regulation and enforcement mechanisms: compatibility between regulation and market mechanisms, market behaviours subject to regulation, tools to enforce market rules, etc.

Recommendations of the Task Forces will try to fit specific markets, ownership regimes and regulatory conditions; there will not be a "one size fits all" approach.

Delegates at the first meeting of SG B.3 agreed a complete matrix of topics and markets as well as a schedule for work to be completed prior to the second meeting.

Internal/external relations

The strong interrelationship of the three Study Groups, particularly B.1 and B.2, was clear throughout the meeting, as well as the importance of the early input of some of the SGs for setting the basis of the *2030 Natural Gas Industry Outlook* study.

The importance of good communication with other IGU Committees was also highlighted, especially with WOC 5, PGC A and PGC C.

The Chairman asked his Co-Chair, Colin Lyle, to help SG leaders to establish and maintain a good level of communication with other Committees, in addition to his task as coordinator of the *2030 Natural Gas Industry Outlook* study.

PGC B delegates were also convinced of the need to exchange information with international energy institutions such as IEA, regulatory authorities and energy policymakers in order to evaluate the potential of incorporating some shared views in the final report.

● Programme Committee C – Developing Gas Markets

PGC C has designed its work activities mainly to support the third Strategic Guideline of the 2006-2009 Triennium "Regional Gas Market Integration as a Key Driver for Sustainable Economic Growth". It is hoped that these activities will also reinforce the work to be undertaken by IGU's other Technical Committees, notably PGC B and the Task Force on Gas Market Integration.

Membership and first meeting

There are currently 37 members of PGC C, including six corresponding members and two alternates.

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Intertek Caleb Brett website: www.intertek-cb.com

Efforts are underway to engage representatives from countries that are covered by the three Study Groups so as to further strengthen access to authoritative sources of data and information.

The first PGC C meeting of the 2006-2009 Triennium was held in Kuala Lumpur, Malaysia, September 13-16, 2006. Ten members participated and the main issues addressed were further refinements to the terms of reference, identifying the leaders and members of the Study Groups and agreeing the work plan and schedule for each SG.

Delegates went on to present the outlooks for the gas markets of their respective countries, highlighting the developments, key issues and concerns affecting the gas markets covered within the Study Groups.

In addition, delegates agreed on the need to organise roundtable meetings to promote dialogue among the key stakeholders from governments, regulators and industry players to contribute to this Triennium's objectives and gain greater visibility for IGU.

Scope and objectives of the Study Groups

Seeking to build upon the studies conducted by PGC C on the developing gas markets in Brazil and China during the last Triennium, the three Study Groups of the current Committee will focus on the following emerging gas markets (see *Figure 3*).

BELOW
Figure 3.

SG C.1 South, West and Central Asia, encompassing India, Pakistan, Iran, Turkmenistan, Kazakhstan, Uzbekistan and Azerbaijan;

SG C.2 South America, from a more integrated perspective and building upon the Brazilian study of the last Triennium; and

SG C.3 South-eastern Europe, in particular to assess the impact of the Energy Community in South-east Europe (ECSEE) Treaty in developing gas markets in the region.

Each Study Group will seek to adopt the following common approach in their analysis, namely:

- Reviewing, analysing and identifying key market drivers of the gas industry in the region;
- Examining the emerging issues and challenges in developing those markets; and
- Proposing possible strategic options to mitigate those challenges.

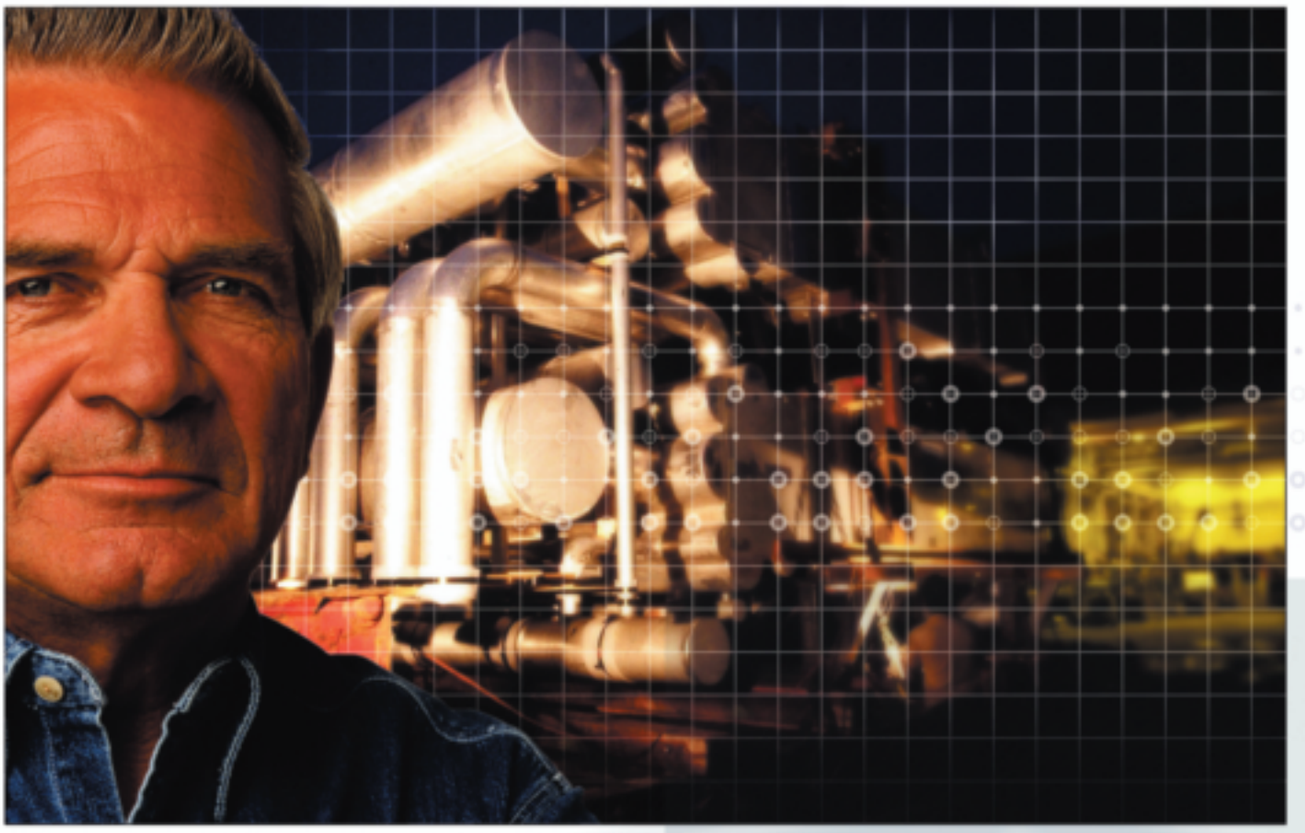
The studies will be conducted against the backdrop of likely developments in the geopolitical situation, the legal and regulatory framework, and national and international environmental policies.

Future plans

At presstime PGC C's second meeting was due to be hosted by the Korea Gas Union in Seoul, South Korea, April 3-5.

● Programme Committee D – LNG

PGC D will continue to monitor the LNG industry closely, providing statistics and highlights on the trends in the LNG trade and shipping. It will also address the latest developments in LNG liquefaction plants and receiving terminals, and provide the future prospective study of the LNG industry, which is one of the key goals for this Triennium. Furthermore, we intend to deal with the issue of security of supply, one of increasing concern to policymakers and the market in general, and which has been specifically included in the second Strategic Guideline of the 2006-2009 Triennium



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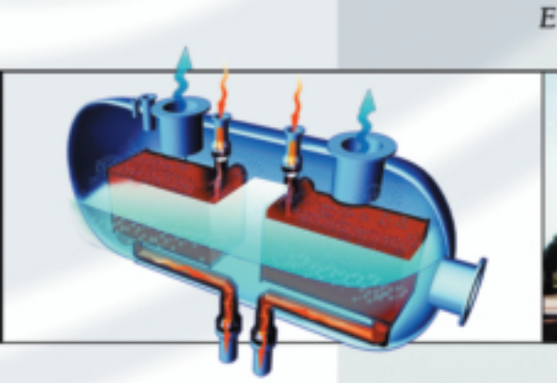

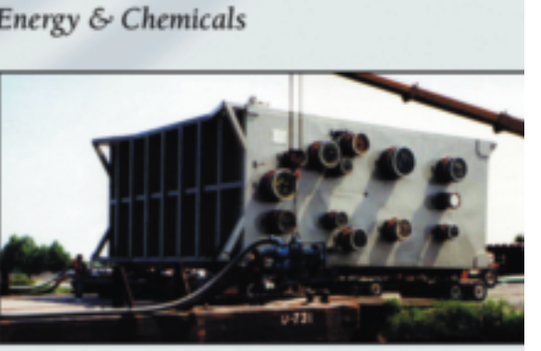

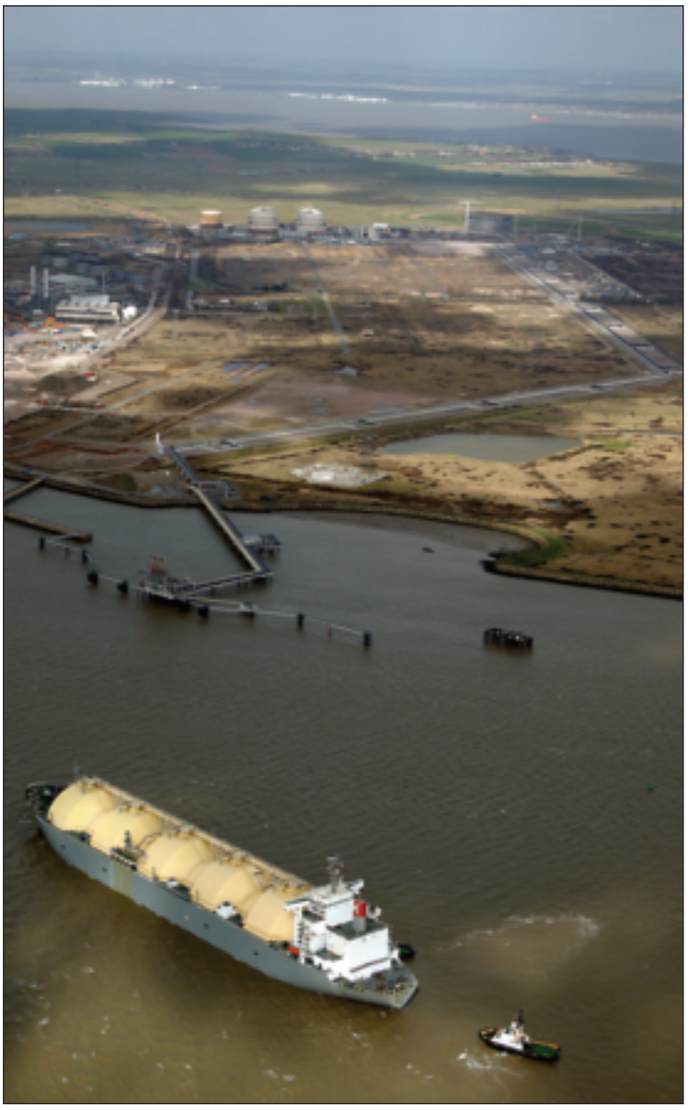

During SG D.1's first meeting there was a site visit to the Isle of Grain LNG terminal.

"Contribution of the Natural Gas Industry, in terms of Security of Supply, Safety and Environment".

Membership and first meeting

PGC D has 82 members from 30 countries and 25 members attended the first meeting in Yokohama, Japan, September 26-28. It was chaired by Seiichi Uchino, Chief Manager, Engineering Section, Energy Production Department, Tokyo Gas Co., Ltd.

The meeting started off with a discussion of the report "The Worldwide LNG Industry at the End of 2007", prepared by the Vice Chairman. A kick-off SG meeting for bonding and topic discussion took place, in preparation of the projects that will be carried out during the Triennium.

The meeting also included a visit to the Negishi reception terminal and technical tours to a variety of LNG and cryogenic use facilities.

PGC D has been organised with a Chairman, Vice Chairman, Secretary, Steering Committee and three Study Groups.

SG D.1 LNG quality and interchangeability

Leader: Martin Josten, BP

Qualities of LNG differ considerably in the various markets around the world: Asia-Pacific, Europe and the USA. To avoid unnecessary and expensive processing at LNG export plants and import terminals, we should promote flexible LNG trading and lower LNG cost. SG D.1 will continue the 2003-2006 Triennium study, filling in some of the gaps by extending the work to more countries and reviewing issues highlighted by some more recent projects. Following the recommendations in the former Study Group report, SG D.1 will make proposals for harmonisation.

The first meeting was held in Egham, UK, November 28-29, 2006. It was attended by 15 members and guests. Presentations were given from the perspectives of the different regions represented, and also on regulatory issues and the views of producers. Brainstorming sessions were carried out to pull together a list of topics, which included N2 ballasting, impurity specifications, analysis and measurement, LNG specifications, rollover, the effect of LNG on gas turbines and appliance testing. There was also a site visit to the Isle of Grain reception terminal. At presstime the second meeting of the Study Group was due to be held in Barcelona just before LNG-15.

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SG D.2 LNG contract clauses for more flexible global LNG markets

Leader: Dr Bo-Young Kim, Head, Centre for Economics and Management, KOGAS

Among the barriers that hinder the sound growth of the LNG market are some of the legal and commercial clauses included in contracts. Since the beginning of the decade this has been increasingly acknowledged by sellers and buyers in several LNG forums. One of the most important objectives of our study is to make world LNG trade more active. We intend to analyse several current standard LNG contract clauses in detail, including the destination clause, the take-or-pay clause and the restriction of flexibility in quantity.

At presstime the first meeting of SG D.2 was due to be held in Barcelona just before LNG-15.

SG D.3 Creative solutions for new LNG facilities

Leader: Rob Klein Nagelvoort, General Manager Gas Technology, Shell Global Solutions

New LNG projects will find it more and more difficult to meet the key criteria of profitability and public acceptability. LNG plants are likely to be in more remote locations, involve more difficult gases, or not have economy of scale; and they will be challenged by high construction costs. LNG terminals are subject to increasing public opposition, and schemes may have to include new ways of providing buffer capacity in markets with large variations. SG D.3 will explore various alternatives (such as new onshore and offshore technologies, and different construction approaches) that can address these issues and provide some promising ideas and guidance.

The first SG D.3 meeting was hosted by Shell in The Hague on November 28, 2006. Six members attended and elaborated on diverse creative technical solutions such as LNG transfer systems, LNG offshore storage and FPSO, and locations like the Arctic, densely-populated areas and small fields. The proposal addressing location was due to be studied and reported on during the second Study Group meeting at the end of March in Korea.

Future plans

At presstime PGC D's Steering Committee was due to meet in Barcelona just before LNG-15. The second full Committee meeting will be held in London in October.

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Progress Reports from the Task Forces

This chapter contains news and information from IGU's two Task Forces.

Task Force Research and Development

During the 2003-2006 Triennium TF R&D looked at R&D trends in the gas industry and highlighted the following points:

- Over the last decade there has been a decline in R&D investment in the gas industry.
- Liberalisation of energy markets has led to R&D being considered irrelevant if it is not directly related to gaining immediate competitive advantages.
- Gas utilisation is the area where the decline is most pronounced.
- Drivers still exist for R&D in areas such as security of supply, asset integrity, safety, and sustainability.
- Financing of R&D is an issue which should involve gas companies and governments.
- Gas companies, however, have the lead role in ensuring that R&D issues are raised and prioritised.

These are the basis on which TF R&D is starting its work for the 2006-2009 Triennium. There are two key objectives:

1. To review, identify and assess means for the effective promotion of R&D throughout the gas industry, with the targets of:
   - proving the strategic value of R&D to companies and their stakeholders; and
   - significantly increasing gas R&D investment.
2. To support and contribute to the success of the IGU Gas Research Conference (IGRC).

Membership and first meeting

TF R&D currently has 23 members, of which 16 are full members, and has a good balance in terms of regional coverage and experience. While new applications have been received, the Task Force will remain a small and motivated group.

The first meeting was held on October 6, 2006 and was attended by 12 members. Presentations and minutes are available on the IGU website in the dedicated TF R&D area.

A presentation on the conclusions and recommendations of the 2003-2006 TF R&D was given by the former Chairman, and the Secretary of the IGRC Technical Programme Committee reported on IGRC-2008 progress.

Discussions were held regarding the definition of R&D and other related words (research, innovation, technology), and several goals and possible TF R&D actions were discussed. Among the goals, the following were identified as the most relevant:

- To prove and sell the idea to CEOs, financial analysts and investors that R&D could make the difference in business.
- In a liberalised market, to get R&D investment accepted by the market regulator.
- To stress that R&D must anticipate any change of the business model – if in the future natural gas utilisation were to drop drastically, all the gas chain would be impacted.
- To define the best practices of R&D management and identify the best R&D organisations.

The terms of reference were modified for clarification and then approved by the members before submission to the Coordination Committee.

Action plan preparation and implementation

The Chairman has proposed a draft action plan based on the discussions of the first TF R&D meeting, consisting of 11 actions (*see box opposite*) which must be addressed by the three working groups established. A leader and a deputy have been appointed for each group and all full members have been allocated to the three groups. The corresponding members have been asked to choose to contribute to at least one of the three objectives. At presstime the second meeting was

ACTION PLAN

Objectives	*Leader*	*Actions*
1 Prove the strategic values of R&D to companies and their stakeholders.	Shigeru Muraki Deputy: Mel Ydreos	1.1 Define strategic R&D issues. 1.2 Compare best practices of R&D management and benchmark R&D organisations from other energy sectors. 1.3 Focus study beyond the traditional gas industry by evaluating from the perspective of manufacturers, electrical companies etc. 1.4 Ensure strong linkage with other Committees or related topics including best practices.
2 Significantly increase gas R&D investment.	Marc Florette Deputy: Samuel Bernstein	2.1 Directly address CEOs of gas companies. 2.2 Promote R&D in general gas forums and make the "Voice of R&D" heard. 2.3 Make R&D a positive expenditure for financial analysts, regulators and investors.
3 Support and contribute to the success of IGRC2008.	Christian Beckervordersandforth Deputy: Dave Pinchbeck	3.1 Create an academic network to promote IGRC2008. 3.2 Propose speakers to address strategic R&D issues. 3.3 Contribute to IGRC business sessions. 3.4 Motivate people to publish innovation and R&D results at IGRC2008.

due to be hosted by Tokyo Gas in Japan, April 12-13.

● Task Force Gas Market Integration

At presstime TF GMI was expecting confirmation of candidates from Iran, Brazil and India, which brings total membership to 13 (all full members) with an adequate global coverage.

The first meeting was held in Mexico City, September 20-22, and was attended by eight full members. The following objectives were defined:

- To harmonise the structures of the energy and gas business to facilitate regional integration.
- To identify the goals that governmental and corporate players must reach to be successful in the process of integrating gas markets.

Members discussed the definition of a methodology to be followed in gas market integration with a preliminary plan divided into five steps. This preliminary definition will be detailed in the final document *Guiding Principles for Gas Market Integration*.

They then addressed the first two steps, identifying: the drivers behind "players, policies and platform"; and the benefits of, and barriers to, the process of integration. Both steps are set in a mind map that will be discussed and developed at the beginning of the next meeting in Germany.

The working schedule for the Triennium was proposed and approved with meetings scheduled to be held in Germany (May), St Petersburg (October), San Francisco (March 2008), Japan (September 2008) and the UK (March 2009).

Deliveries from the Task Force for the Triennium will be the following:

- Guiding principles of gas market integration.
- General report of the work during the Triennium.
- Round table.
- Possible paper about gas market integration in the October issue of the IGU magazine.

Also it was decided that members will try to get in contact with colleagues from their countries who are working in other Study Groups (with links to TF GMI) to exchange opinions about the principal guidelines of their work.

Finally, the following preliminary agenda for the next meeting was agreed:

- Review and approval of the minutes of the Mexico City meeting.
- Analyse possible themes for the article to be published in the next issue of the IGU magazine.
- Work on the submitted deliveries concerning the development of specific definitions, drivers, benefits, key considerations and option-enablers defined in the mind map.
- Analyse the European market integration case.

TOTAL

- ***Major gas producer – Nr 4 in the world, Nr 3 in Europe***
- ***Leading LNG player – among the top 3 in the world***
- ***Growing gas distributor – Nr 2 in the UK, Nr 2 in France***
- ***Benchmark power expertise – cogeneration***

Natural gas

Natural gas is expected to post one of the strongest growth of all fossil fuels over the next decade – an average of around 2.5% a year globally – driven by demand from the power generation segment.

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Involvement in all segments of the gas industry makes Total a preferred partner for a large number of gas projects worldwide.

LNG

Total helped to pioneer the LNG industry in the 1960s and today is a partner in liquefaction plants accounting for almost 40% of global capacity.

More than a quarter of our gas production is already valorised as LNG and we continue to strengthen our positions along the LNG chain, aiming for growth of 10% per year by 2010. Total has new projects in Yemen, Angola, Norway, Iran, Nigeria and Australia as well as plant extensions in Nigeria and Qatar.

At the consumer end, Total has acquired interests in four regasification terminals to ensure additional markets for production from the Middle East, the Gulf of Guinea and, in the future, Northern Europe. India's Hazira terminal was inaugurated in April 2005. In October 2006, commercial operations began at the Altamira regasification terminal (Mexico), and France's Fos Cavaou is due to begin operations this year.

Besides, from 2009, Total will have capacity in the Sabine Pass terminal on the US Gulf coast.

Moreover, Total will also hold an 8.35% interest in the South Hook LNG terminal located in Milford Haven, in South Wales (United Kingdom). The two train facility is designed to process 15.6 million tonnes per year (mtpa) of LNG and is expected to begin operation with a first train in early 2008.

By 2010, we plan to have a regasification capacity of about 20 Mtpa and a balanced spread between Asia-Pacific and the Atlantic Basin.

Total also has got a long experience of LNG shipping, placing great emphasis on safety. We devote considerable energy to checking that vessels are maintained to the highest standards and ensuring that crews are properly trained. Total's expertise includes tanker design; the Group is a partner in GazTransport & Technigaz, which develops membrane technologies for LNG carriers. More than 90% of carriers on order today deploy these technologies.

Pipelines

Total has contributed significantly to developing a Western European gas pipeline network to carry our North Sea production. We now have interests in 11,000 kilometres of high-pressure pipeline in Europe and operate close to 5,000 kilometres of pipeline in France.

Gas & Power has also expanded its presence in South America with the acquisition of substantial interests in pipelines (9,400 kilometres in all) in Argentina, Chile and Brazil.

Natural gas storage

Storage is a critical logistics tool for gas distribution, ensuring security and adjustment of supply to meet sharp seasonal variations in demand. It also enables optimisation of upstream investment, in particular in transmission and production infrastructure.

Total owns and operates two underground storage facilities in France, with a combined capacity of 2.4

billion cubic metres (bcm), approximately 22% of the total natural gas storage capacity in France.

By developing underground storage facilities in France we help create major gas hubs, ensuring market fluidity and boosting growth by making natural gas more competitive in Europe.

We also have a stake in Géostock, which specialises in designing, building and operating underground storage facilities.

LPG storage

Total has now acquired broad experience in liquefied petroleum gas (LPG) storage. In November 2003, we signed an agreement with Hindustan Petroleum Company Ltd, India's third-largest refiner, to build an LPG import and storage terminal in the port of Visakhapatnam.

The facility, with a capacity of 60,000 metric tons, is under construction and expected to begin commercial operation in second half 2007.

Gas marketing and trading

Gas market deregulation is moving forward worldwide, and especially in Europe. Against this backdrop, Total is strengthening its positions in marketing natural gas to industrial and commercial (I&C) consumers.

We have gained considerable experience in the United Kingdom, the first EU market to be deregulated, beginning in the late 1980s. Total is one of the I&C market leaders, with over 50,000 gas customer sites and sales in 2005 of over 5 bcm, giving a market share of around 20%. Total also supplies electricity to I&C consumers.

As deregulation advances, we are capitalising on this experience to expand our presence in continental Europe, especially Spain and France. A key asset here is comprehensive expertise that enables us to efficiently meet varied customer expectations. In France, we were the first to gain a foothold in the eligible customer market before the I&C market was fully deregulated and our target is to double our market share, from just under 10%, within five years. We are currently the Nr 2 operator in France with 16% of the overall natural gas market. Total's sales Europe-wide nearly doubled in 2004, reaching 13 bcm.

In the US, our gas sales exceeded 17.5 bcm in 2005 and we have also set up an organisation in South America to market gas from Argentina and Bolivia across the Southern Cone.

Last but not least, Total boasts an experienced gas-trading team in London that lets us optimise flow management on a global scale, leverage our production and outlets, and secure margins thanks to hedging in markets.

Power generation

Power generation is the main outlet for the gas chain. Gas-fired power stations already account for 40% of demand for natural gas and this could be nearly 50% by 2030.

With a view to enhancing integration here, Total is a partner in several gas-fired power projects in Asia, Africa and the Middle East, while also operating smaller cogeneration plants at Group refineries in Europe and the US.

Our commitment to cogeneration is reflected in the 2003 commissioning of the Taweelah A1 facility in Abu Dhabi. Rated at 1430 MW and with a seawater desalination capacity of around 385,000 cubic metres per day, this is one of the largest cogeneration plants in the world, and is 35% more efficient than a conventional power plant. The Group recently approved a capacity expansion to 1600 MW for Taweelah A1.

In Thailand, Total has a 28% stake in EPEC, which commissioned the 350 MW Bang Bo combined-cycle power plant in March 2003.

In Nigeria, alongside Shell, Total is a 10% partner in the gas-fired combined cycle power project AFAM (AFAM V: 276 MW, AFAM VI: 600 MW). Together with NNPC, the Group is also building a new 400 MW combined cycle power plant near Obite.

R&D for gas and power

From 2002 up to now, Total has been sole international gas player among a consortium of nine Japanese partners, developing a 100t/d demonstration plant with a successfully process of direct synthesis of gas to DME.

Currently, Total is involved in several R&D projects regarding gas chemical transformation such as the CTL and GTL processes and technological challenges.

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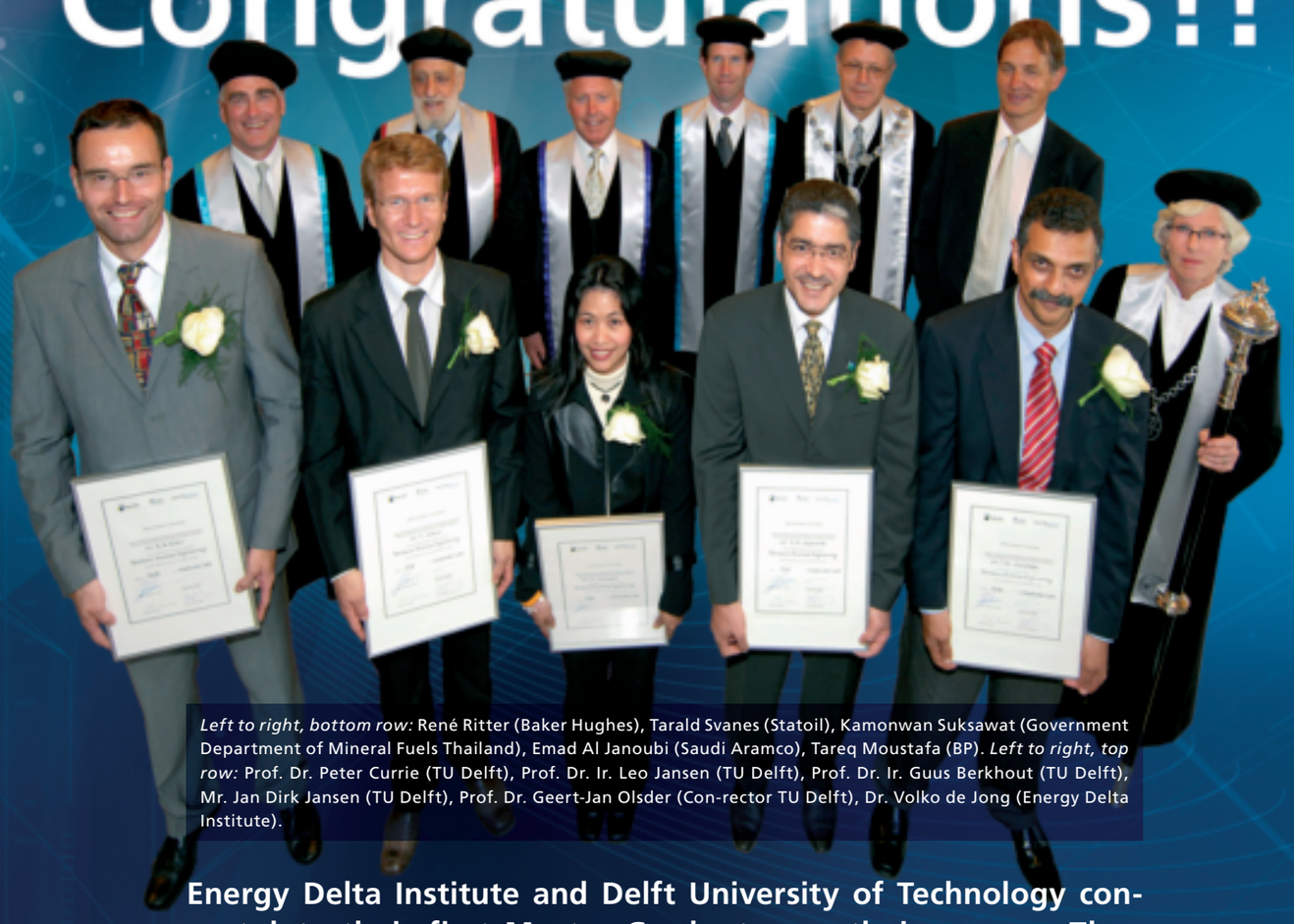

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FEATURES

This issue's feature section starts with an overview of global LNG developments, followed by a focus on GTL in Qatar. Maintaining the transport theme, there are articles on pipeline developments in Europe and how to prevent third party interference. We continue with the second part of a survey of the gas industry in South America, a focus on WOC 1's work, the conclusions of a Norwegian study on CO_2 injection and a report on the forthcoming IGRC2008 conference in Paris. Then Larry Ingels writes about his experiences as an IGU Committee Secretary. We round up with a description of the publications and documents available from IGU and the events calendar.

Shell LNG Technology

Shell is a pioneer in the LNG industry with more than 40 years of experience in LNG technology, production, shipping and marketing. Brunei LNG, in which Shell owns a 25% interest, has been producing LNG for some of the world's biggest markets since 1972 and has seen a capacity increase of 40% through innovative debottlenecking activities over its lifetime.

Today, Shell is the leading IOC with interests in LNG plants in Australia, Brunei, Oman, Malaysia and Nigeria that together produced approximately one-third of the world's LNG production in 2006.

Shell Global Solutions, provider of technology and technical services to a number of Shell joint venture operations, has a 100% record in meeting design capacity with its LNG technology, while delivering a low unit cost LNG. LNG plants where Shell Global Solutions is technical adviser set the industry benchmark in reduced CO_2 emissions.

Shell offers a portfolio of LNG plant designs, tailored to specific needs of Major Resource Holders and JV partners, delivering average plant utilisation of 95%, which is 10% higher than the 85% industry average (without Shell).

The Shell LNG technology portfolio includes a number of cost-effective and robust liquefaction processes covering a full range of 2-12 million tonnes per annum (Mtpa) LNG production capacity (*see Fig. 1*). The processes are based on two refrigeration cycles in series using well-proven tubular heat exchangers in pre-cooling and main liquefaction cycles, combined with proven rotating equipment.

The Shell Propane-precooled Mixed Refrigerant process (C3/MR) is a version of the well-known C3/MR process. It captures a number of configurations and features developed during more than 40 years of Shell LNG experience. Latest examples of the Shell C3/MR process application are the North West Shelf LNG Trains 4 and 5 in Australia.

The process is typically built around two equal drivers, the first one of which drives the propane cycle and the second one the mixed refrigerant cycle. The drivers are usually industrial gas turbines. A unique feature of the latest C3/MR version is the so-called "Split Propane" compressor. It is a four-stage machine with stages 1 and 3 combined in one casing and similarly stages 2 and 4 combined in the other casing. In both casings, mounted on the same shaft, the flow is compressed to the common discharge pressure of the cycle. This line-up allows better power utilisation within the aero-dynamic compressor constraints, stretching the maximum capacity of a 2 x 90 MW driver train from 4.5-5 to 5-5.5 Mtpa.

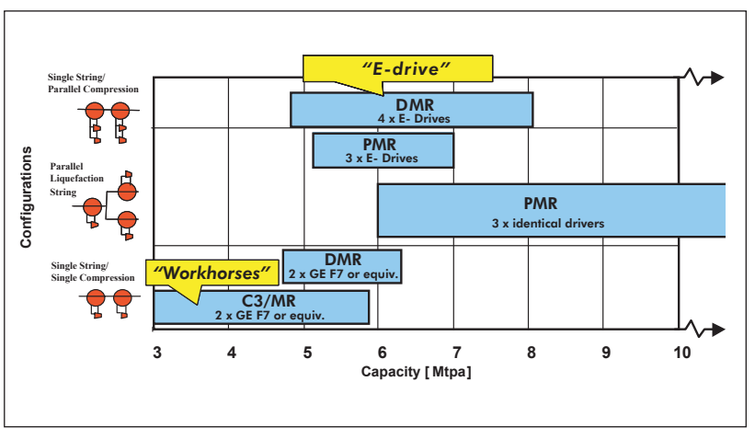

Figure 1: Shell LNG technology portfolio.

To overcome the limitations imposed by the use of a single-component refrigerant in the pre-cooling cycle, Shell has developed the ***Dual Mixed Refrigerant (DMR) process*** (*see Fig. 2*). The DMR process uses a mixed refrigerant in both the