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International Gas OCTOBER 2011

The IGU Magazine

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Vision, Mission and Objectives

The International Gas Union (IGU) is a worldwide, non-profit organisation promoting the progress of the gas industry. Through its many member countries representing approximately 95% of global gas sales, IGU covers all aspects of the natural gas industry.

The Vision

Recognising that natural gas has an important part to play in satisfying the global need for an environment-friendly energy source, IGU will be the most influential, effective and independent non-profit organisation, while serving as the spokesman for the gas industry worldwide.

The Mission

IGU will actively, directly and through its members, promote the technical and economic progress of the global gas industry.

IGU will work towards improving the competitiveness of gas in the world energy markets. By promoting the development and application of new technologies and best practices, IGU will help optimise the economics of the entire gas chain, while emphasising sound environmental performance, safety and reliability.

IGU – serving as a global information clearing house – will promote transfer of technology and know-how.

In carrying out this mission, IGU will maximise value to its members and gas customers.

Objectives

In striving towards the vision and fulfilling the mission, IGU will regarding:

ECONOMY: Promote all activities within the entire gas chain, which can add to the technical and economic progress of gas;

CUSTOMERS: Encourage development of good customer services and customer relations;

TECHNOLOGY: Encourage research and development towards new and better technologies for the gas community;

SAFETY: Promote the safe production, transmission, distribution and utilisation of gas;

ENVIRONMENT: Encourage and promote development of clean technology, renewable energy applications and other activities, which will add to the environmental benefits of gas;

INTERNATIONAL GAS TRADE: Encourage international trade in gas by supporting non-discriminatory policies and sound contracting principles and practices;

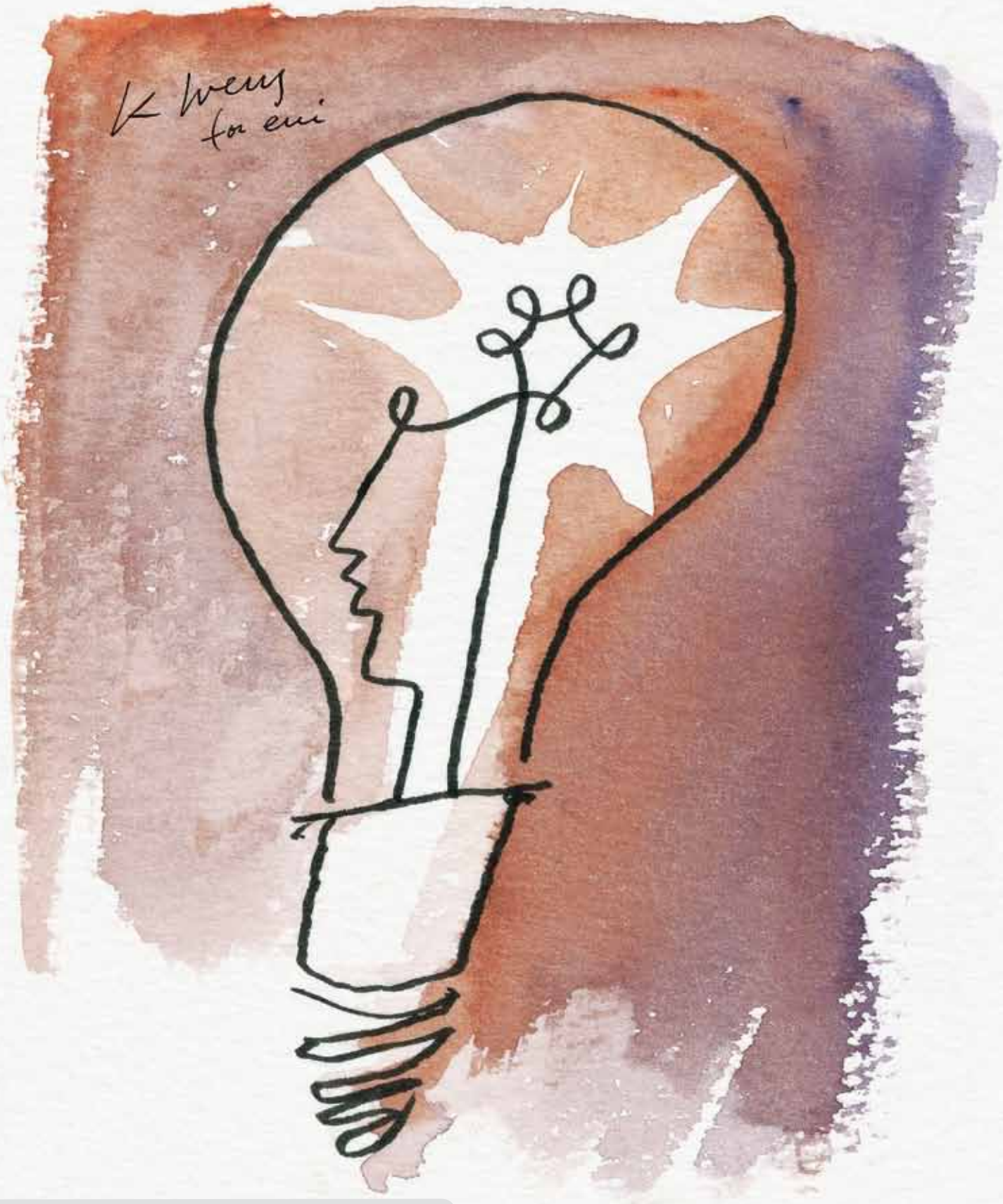
LEGAL: Promote and contribute to the development of legislation concerning:

- the establishment of equitable, non-discriminatory and reasonable environmental and energy efficiency regulations, and
- efforts to establish appropriate and relevant international standards,

as well as

- the promotion of and participation in the exchange of information relating to regulatory processes;

COOPERATION: Enhance partnership with industry and manufacturers, and cooperation with governments, policy makers and international energy related organisations, and promote the exchange of information among members in order to help them in improving the efficiency and safety of gas operations.



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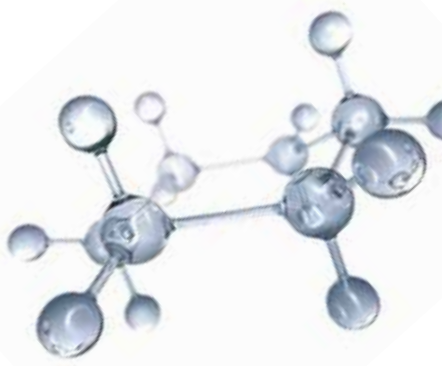

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Contents

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Unless otherwise stated, the dollar ($) values given in this magazine refer to the US dollar.

Turning partnerships into prosperity

In the energy business, strong working partnerships are the key to success. At every stage, from gas exploration to distribution, we work closely with our partners. We share with them our technical expertise, employ local people, invest in their communities and work together to find the right markets to maximise the value of our partners' natural resources.

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Message from the President

Dear Colleagues

It is a great pleasure to update everyone on significant events and activities that have happened since the April issue of *International Gas*.

On behalf of the IGU fraternity, I offer our deepest condolences to our colleagues in Japan for the devastating losses and massive damage suffered as a result of the earthquake and tsunami which hit the country in March. We share with you, and the Japanese people, your deepest grief and sufferings.

The damage caused by the earthquake to the Fukushima nuclear power facility has unveiled to the world the dangers which nuclear power facilities can pose to people and the environment and raised further concerns about the safety of such plants. More than six months after the earthquake struck, the owner of the facility is still struggling to plug the radiation leak from the damaged nuclear plant. The complex, dangerous nature of the problem has raised further safety concerns. As a result, several countries have decided to stop further nuclear power expansion, or are considering dismantling existing plants.

With the growth of the global nuclear energy sector expected to stagnate for the foreseeable future, the world will have to look for alternative energy sources to fill the growing demand gap. There will be a strong push towards renewable energy, but natural gas presents itself as the readily viable solution, given its abundance, low-carbon intensity and high efficiency.

This situation has presented IGU with an invaluable opportunity to further advocate and strengthen its case to make natural gas the world's preferred source of energy. The International Energy Agency (IEA) is among those who consider the economics and trends suggest we could be entering into a "golden age of natural gas",

Datuk (Dr) Abdul Rahim Hashim, President.

according to its recent special report. But this opportunity demands more intensified efforts to advocate for gas from members at all levels.

Events update

In early March, IGU's Programme Committee on Strategy (PGC B) organised the first workshop on "Regulatory Issues of Global Significance" with the International Confederation of Energy Regulators (ICER) in Washington DC. Task Force 3 on Natural Gas and Geopolitics continued the series of regional roundtables with a roundtable for the Middle East which was held in Muscat, Oman on April 19. Another first is the Marketing Summit organised by the Programme Committee on Marketing (PGC E) held in Munich on May 13. All these events were well received and demonstrate that IGU is actively promoting the progress of the gas industry.

In early April, the Executive Committee met in Rio de Janeiro to discuss IGU developments including the candidacy for the Presidency for the Triennium beginning in 2015. As of the closing date for applications, four countries had shown keen interest in taking the helm of IGU, namely Brazil, Qatar, South Korea and the USA. However, Brazil withdrew from the race leaving the remaining three countries to make their cases during the Council

meeting in Dubrovnik, Croatia when the election for the 2015-2018 Presidency will take place.

One significant event scheduled after the Council meeting is the IGU Research Conference (IGRC2011) that will take place from October 19-21 in Seoul, Korea, with the theme "Innovation is the Key to a Sustainable Future". This conference will showcase some of the latest innovations and technological developments in the gas industry and is a "must attend" event for all decision makers and business executives in the gas fraternity.

Forging alliances

IGU continues to strengthen existing alliances and foster new ones so we can strengthen our advocacy for natural gas. In May, we met the new Secretary General of Eurogas, Ms Beate Raabe, and the CEO of the European Climate Foundation (ECF), Dr Johannes Meier. These meetings helped us to understand the issues and challenges in advocating for natural gas in Europe, particularly in the development of the European Energy Roadmap for 2050. Another significant development is our desire to work with the United Nations, particularly in addressing the issue of energy poverty. We were invited to participate in the Vienna Energy Forum, organised by UNIDO (United Nations Industrial Development Organisation) in June, where we had the opportunity to meet energy ministers and NGO representatives from the renewable energy sector and be part of the BBC world debate on energy.

Breakthrough development

In its 80th year, IGU has finally published its own annual world LNG report. In June, during the opening ceremony of the 16th Asian Oil and Gas Conference in Kuala Lumpur, IGU successfully launched the inaugural *World LNG Report 2010*. This report covers the state of the LNG industry across the entire chain – liquefaction, shipping, regasification and trading. It also provides analysis and projections on the state of the industry. A special section reports on the impact of unconventional gas on the LNG industry. It is hoped this report will serve as a useful reference for seasoned professionals and those interested in the LNG business. We thank the LNG Study Task Force in PGC D for overseeing the report's preparation and PETRONAS for graciously sponsoring the report's costs. Available in hardcopy, the report can also be downloaded from the IGU website.

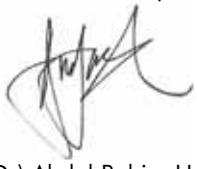
Preparations for WGC2012

As the Malaysian Triennium moves into its final phase with the 25th World Gas Conference (WGC2012) just around the corner, the next few months will be a very busy period for the Technical Committees and Task Forces. The five Programme Committees (PGCs), five Working Committees (WOCs) and three Task Forces (TFs) are racing to complete their targets and final reports.

I am pleased with the progress of WGC2012 preparations. Our technical programme is almost ready with confirmations from most keynote and luncheon speakers secured. About 90% of the exhibition space has already been committed. The numbers of delegates already registered and abstracts received from members who wish to present papers during the conference have been very encouraging.

Reflecting on the past two years, a great deal has been achieved. We are on the right track to position IGU at the forefront of the world's natural gas industry. I attribute these successes to the hard work of the various teams and their team leaders. I thank all the companies which have generously allowed their staff to participate in the various teams and provided valuable financial support. The strong spirit demonstrated is a prerequisite if we wish to see IGU assume the leadership and become the voice of the world's natural gas industry.

We look forward to your continued support.



Datuk (Dr) Abdul Rahim Hashim

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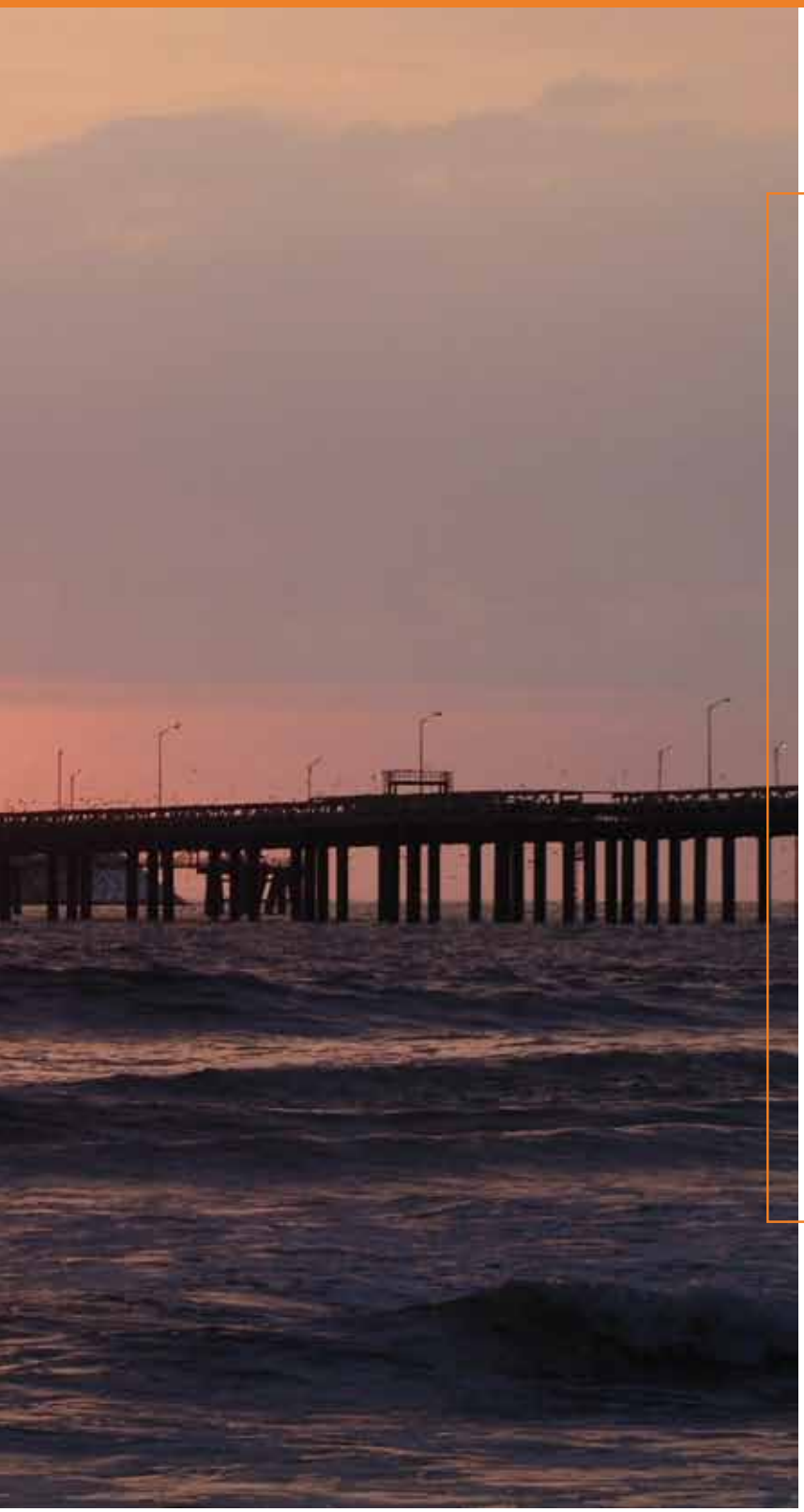

Melchorita LNG Plant, Peru

Repsol holds a 20% stake in the Perú LNG Liquefaction Plant that was inaugurated in June 2010 with a nominal capacity of 4,4 million tons per year.

Repsol also owns 10% of the Camisea consortium which supplies the Perú LNG Plant through a 408 kilometre gas pipeline.

Repsol has the exclusive rights to market the entire output from Perú LNG.

The first cargo was delivered by the Barcelona Knutsen Carrier, with a capacity of 173,400 m^3, in June 2010 to the Costa Azul energy terminal in Mexico.

The target market for the LNG from Perú would be the Manzanillo terminal in Mexico whose start-up is scheduled for the 4Q 2011 according to the LNG supply contract signed between Repsol and the Federal Commission of Electricity (CFE) in 2007. This contract envisages the supply of LNG to the Mexican plant for a period of 15 years and with a volume of at least 67 bcm.

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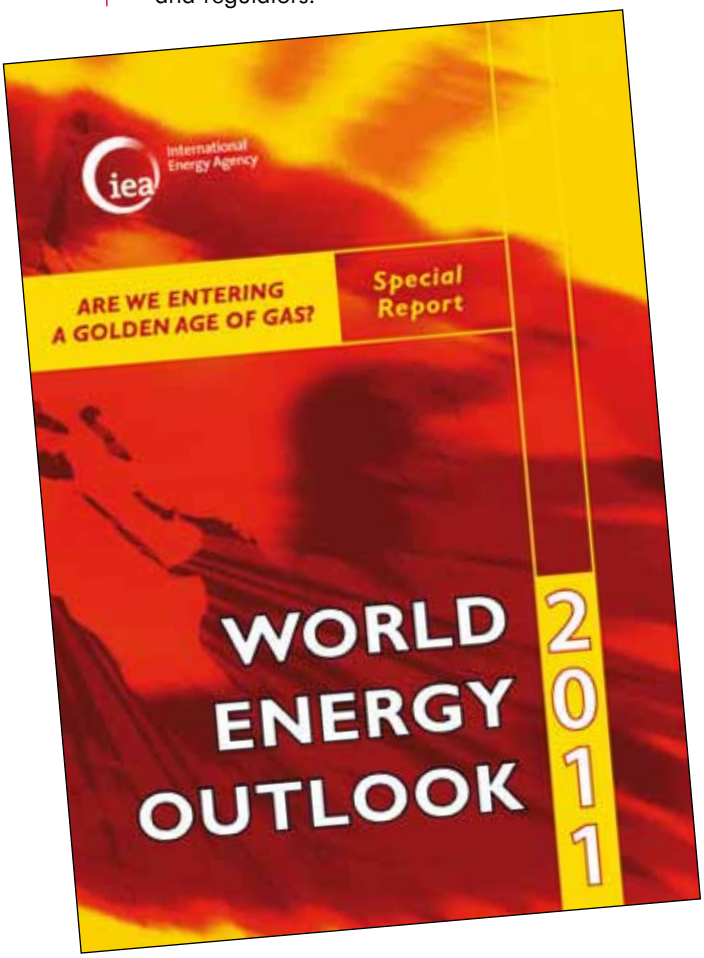
Let's invent the future

Message from the Secretary General

Dear Reader

Energy policy

Energy policies continue to impact our current and future business framework. Our industry is extremely capital-intensive and makes long-term plans, often with an investment horizon of more than 20 years. The IGU management has therefore increased the focus on information and communication towards policymakers and regulators.



The IEA's special report highlights a more positive future outlook for gas.

Torstein Indrebø, Secretary General.

Energy issues vary around the world with important regional differences. In Europe, the EU is preparing its Energy Roadmap 2050 to set the direction towards reducing CO_2 emissions with the target being an 80-95% drop from 1990 levels. In addition to environmental factors, the main considerations for the EU will be economic competitiveness and supply security.

With IGU Charter and Associate Members in 23 out of 27 EU countries, we encourage each one to contact the national bodies responsible for EU energy policies to share facts and figures on how gas can contribute to the long-term energy goals of the EU. IGU has prepared an information package that can be downloaded from our "Gas Advocacy" folder on the website to support communication activities. Together with five European-based gas associations, IGU will organise a gas event in Brussels in early 2012 to address the content of the Energy Roadmap 2050 with EU parliamentarians and European Commission management.

The proactive gas advocacy work by many parties around the world is gradually producing positive results. The International Energy Agency recently released a special report, *Are We Entering*

a Golden Age of Gas?, which will be included in the *World Energy Outlook 2011* and highlights a more positive future outlook for gas. Other reports point in the same direction.

I am confident that the potential of natural gas in solving the global energy challenges will be increasingly appreciated as gas can provide cost-effective and realistic energy solutions for the world.

IGU cornerstone events

For 80 years IGU has developed its global events to service the educational, commercial and networking needs of the gas industry. We hope you will prioritise the IGU conferences when making decisions on participation and exhibiting. Our largest and most important upcoming events are:

- The IGU Research Conference 2011 which takes place in Seoul, Korea, October19-21. This is the largest global conference focusing on innovation and technological progress in the gas industry. IGRC2011 will provide a unique opportunity to see what the future has in store for our business.
- The World Gas Conference is IGU's most important and largest conference. WGC2012 will be held on June 4-8, 2012 in Kuala Lumpur, Malaysia. The whole world's gas and energy industry will meet there along with policymakers to discuss global energy-related challenges. This event will be a great professional and social gathering with more than 5,000 participants expected.
- The 17th International Conference and Exhibition on LNG (LNG 17) will be held on April 16-19, 2013 in Houston, USA. This event is organised jointly by IGU, the Gas Technology Institute and the International Institute of Refrigeration. It is the world's biggest and most influential conference that focuses on the LNG industry.

Commemorative publication

On June 2, this year, it was 80 years since IGU was established in London, and next year IGU will organise its 25th World Gas Conference. We will mark these two anniversaries with a special publication giving an overview of the history of IGU and the gas industry. The publication will be issued for WGC2012 and made available to all delegates.

Enjoy the many good articles in this edition!

Torstein Indrebø

Gas can provide cost-effective and realistic energy solutions for the world.

Conviction to share

Imagine if a long-term energy future also depended on the discovery of new oil and gas resources

Although oil and gas resources are still plentiful, to satisfy growing demand both now and in the future Total continues to make significant discoveries. Relentlessly seeking to increase the productivity of oil and gas field reserves, we innovate to exploit new sources of fossil fuel. But because oil and gas are precious, it will be vital to focus their usage in those areas where it is hardest to replace: in transportation and petrochemicals.

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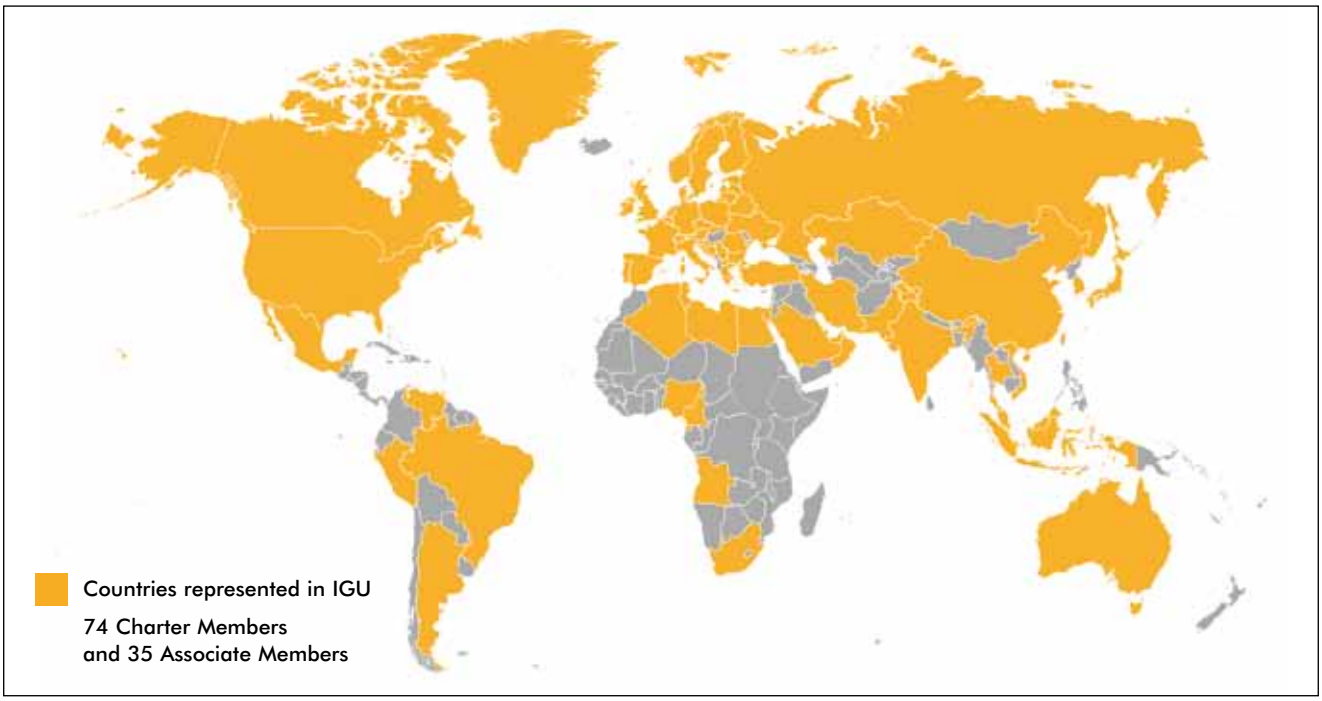

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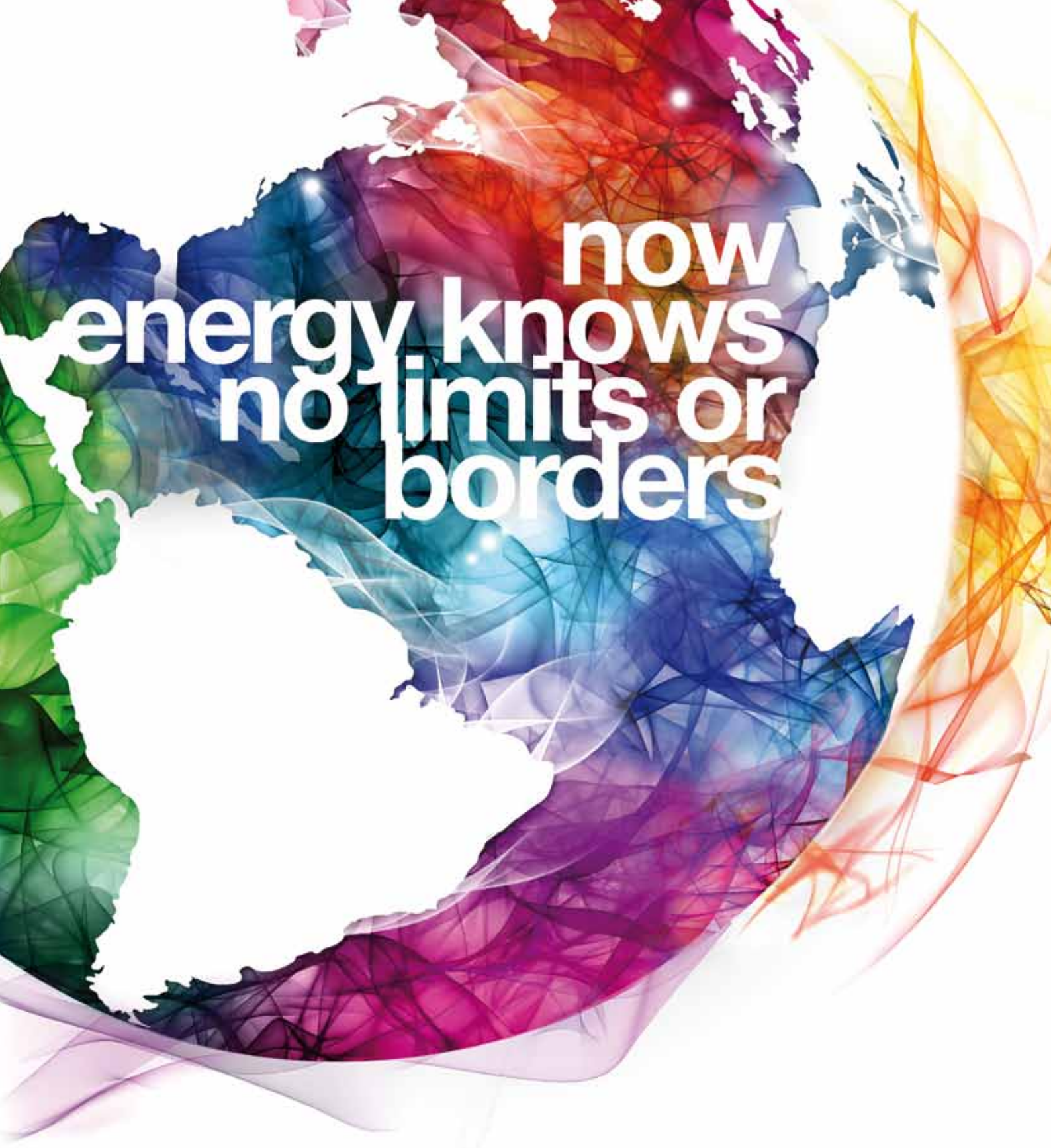

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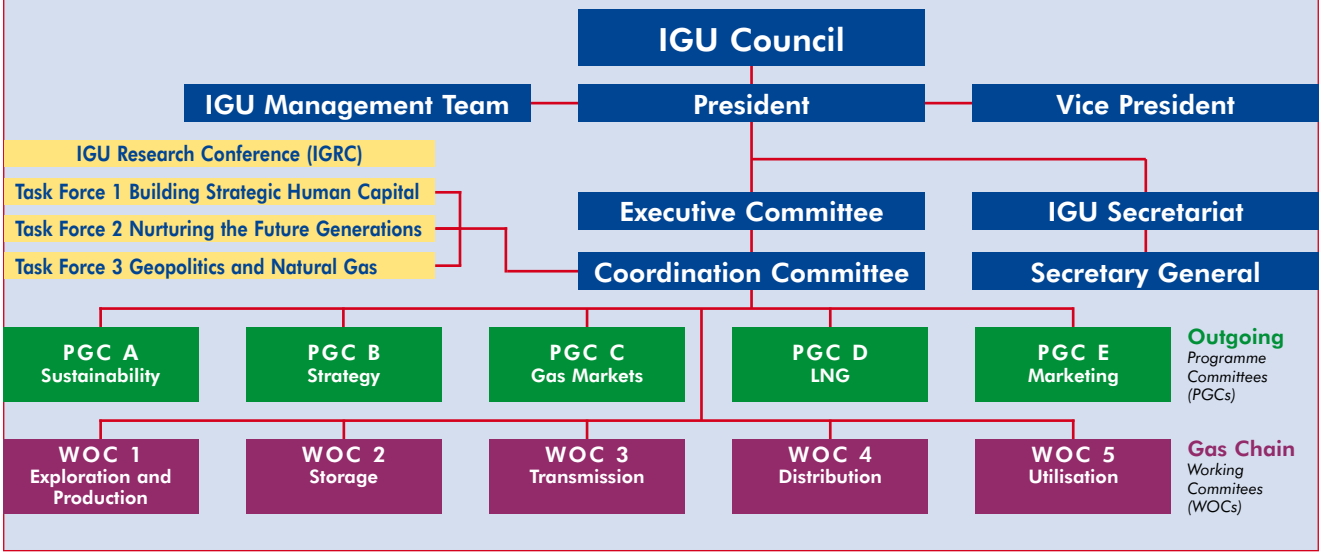
IGU Organisation 2009–2012



This photograph was taken at the Executive Committee (EXC) meeting which was held in Rio de Janeiro, Brazil, in April.

From left to right in the front row are: Colin Lyle, Ho Sook Wah, Torstein Indrebø (IGU Secretary General, not a member of the EXC), Datuk (Dr) Abdul Rahim Hj Hashim, Ernesto López Anadón, Jérôme Ferrier, Ieda Correia Gomes and Miloš Kebrdle.

From left to right in the middle row are: Ichiro Baba (Secretary of WOC 5, not a member of the EXC), Kap-young Ryu, Mel Ydreos (who was substituting for Shahrzad Rahbar), Marcel Kramer, Antoni Peris Mingot, Jupiter Ramirez (who was substituting for Alaa Abu Jbara), Runar Tjersland, Yves Tournié, Fethi Arabi (who was substituting for Nordine Cherouati), João Carlos de Luca and Carlos Eduardo de Freitas Brescia.

From left to right in the back row are: Man Fai Sham (who was substituting for James Kwan), Georges Liens, Tatsuo Kume (who was substituting for Kenji Ikejima), Evgueni Riazantsev, Daniel Paccoud, Walter Thielen, Jorge Paulo Delmonte (one of the Brazilian hosts, not a member of the EXC) and David N. Parker.

Khaled Abubakr, Domenico Dispenza and Wang Guangjun sent their apologies.

IGU MANAGEMENT TEAM

Datuk (Dr) Abdul Rahim Hj Hashim, President (Chairman) (Malaysia)

Mr Jérôme Ferrier, Vice President (France)

Mr Ernesto López Anadón, Immediate Past President (Argentina)

Mr Ho Sook Wah, Chairman of the Coordination Committee (Malaysia)

Mr Georges Liens, Vice Chairman of the Coordination Commitee (France)

Mr Torstein Indrebø, Secretary General

IGU EXECUTIVE COMMITTEE

Mr Nordine Cherouati, Algeria

Mr Ernesto López Anadón Argentina

Mr Carlos Eduardo de Freitas Brescia, Brazil

Ms Shahrzad Rahbar Canada

Mr Miloš Kebrdle Czech Republic

Mr Jérôme Ferrier France

Mr Georges Liens France

Mr Daniel Paccoud France

Mr Walter Thielen Germany

Mr Domenico Dispenza Italy

Mr Kenji Ikejima Japan

Mr Kap-young Ryu Republic of Korea

Datuk (Dr) Abdul Rahim Hj Hashim, Malaysia

Mr Ho Sook Wah Malaysia

Mr Marcel Kramer The Netherlands

Mr Runar Tjersland Norway

Mr Alaa Abu Jbara Qatar

Mr Evgueni Riazantsev Russia

Mr Antoni Peris Mingot Spain

Mr Colin Lyle United Kingdom

Mr David N. Parker United States of America

James Kwan IGU Regional Coordinator for Asia-Pacific

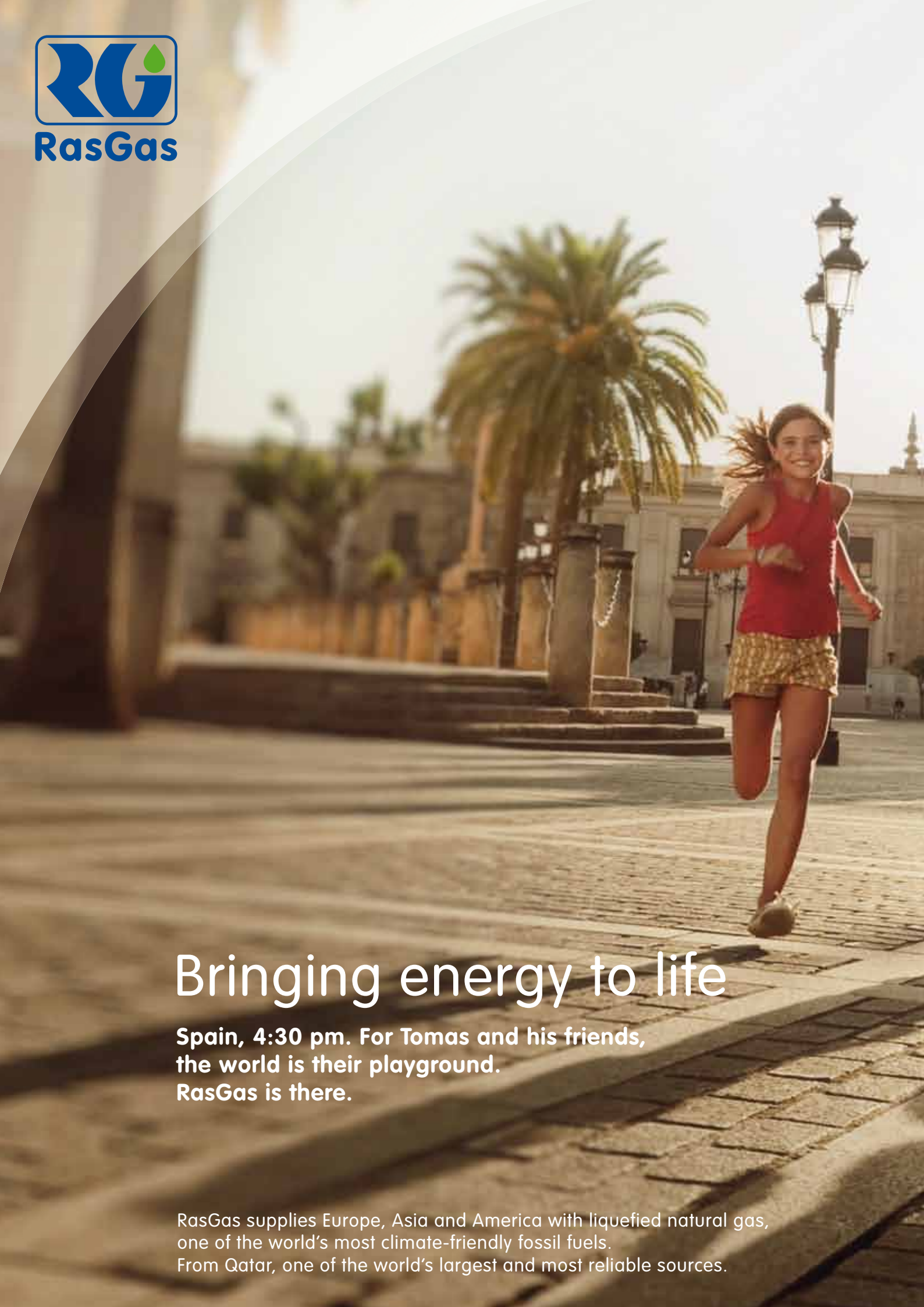
Ms Ieda Gomes BP Gas, Power & Renewables, Associate Member

Mr Wang Guangjun, China National Petroleum Corporation, Associate Member

Mr João Carlos de Luca Instituto Brasileiro de Petróleo, Gás e Biocombustíveis, Associate Member

Mr Khaled Abubakr, Taqa, Associate Member

Mr Yves Tournié Total, Associate Member



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THE ENERGY TO TRANSFORM

News from the Secretariat

The IGU Secretariat's main activities since the last edition of the IGU Magazine (April 2011) are detailed below in news items and information from the Secretary General (TI), Director (HR), Communication Manager (SRB), Advisor to the Secretary General (JvD) and Advisor to the Secretary General (CO).

Secretariat staff changes

Erik Gonder has left the Secretariat

Erik left the Secretariat on July 1 to assume a position as Investor Relations Officer in Statoil's department for investor relations. His new role in Statoil will bring him in close contact with the global financial markets. I am confident that his experience from IGU and the gas advocacy work will be very helpful in his communication with investors and market players.

Erik has been with the Secretariat since the transfer to Norway on November 1, 2007, and has been responsible for the communication activities of IGU including the website. Under his management, a new standardised design has been introduced for IGU publications and several reports and brochures have been published to enhance the visibility of IGU and our advocacy work. Erik has also expanded our press contacts internationally. Furthermore, he has managed to establish the biennial IEF-IGU Ministerial Gas Forum and our Gas Symposium at the annual UN Climate Change Conference as two high-profile events which attract political and industry leaders at the highest level. Many thanks to Erik for his dedication and efforts for IGU and the gas industry!

The staff of the IGU Secretariat. *From left to right,* Erik Gonder (who has now handed over to Sjur Bøyum), Jeanet van Dellen (Advisor to the Secretary General), Torstein Indrebø (Secretary General), Hans Riddervold (Director) and Carolin Oebel (Advisor to the Secretary General). Åse Nicolaysen (Administration Assistant) is seated.

Sjur Runar Bøyum – new Webmaster and Communication Manager

Sjur Bøyum, 57, has returned to Norway after working abroad to take over from Erik. Sjur has three decades of experience in the oil and gas industry. For the last 20 years he has been working on gas issues including transportation, storage and sales. Latterly, Sjur was part of the team managing the Statoil gas assets in Germany. His main responsibilities in the IGU Secretariat include the website, member services, publication and communication issues and our presence at key international events.

Sjur Runar Bøyum.

Ksenia Gladkova.

Åse Nicolaysen has left the Secretariat

Åse left the Secretariat in mid-September to assume a new position closer to her home. Åse had been with the Secretariat providing administrative support since the transfer to Norway. She was instrumental in administering the finances of IGU, building a proper archive and filing system, managing the membership contact database and facilitating our communication activities in addition to taking an active part in the many daily tasks of the Secretariat. We are all very thankful for Åse's contribution in supporting and improving the services of IGU to all our stakeholders.

The IGU secondment programme

Jeanet van Dellen will return to Gasunie by mid-November. She has been with IGU since February 2009 and has made important contributions to a wide range of areas during this time. Initially, she managed our membership and marketing plan and helped bring in new members. She went on to administer the IGU Gas Award programme, contribute to the Executive and Council meetings, represent IGU on different occasions and help Erik in organising the IEF-IGU Ministerial Gas Forum. In particular I would like to highlight Jeanet's work in providing secretariat services to the Policy Committee of the IGU Research Conference, and her contribution to the restructuring of the IGU research activities leading up to the decision to establish a new Programme Committee for R&D in the 2012-2015 Triennium. Her most recent task has been to organise, in cooperation with other gas associations, a Gas Event in Brussels to advocate for the role of gas in the EU Energy Roadmap 2050.

Jeanet has been a very good representative for IGU, and it has been a pleasure to have her as a colleague. We are very grateful to Gasunie for seconding such a competent and talented person to IGU.

Ksenia Gladkova is the new secondee to IGU. Ksenia, 40, has moved to Oslo with her family and started work in the Secretariat in August. Ksenia has a broad background in the energy industry having worked in several positions for Total since 2000. She is Russian and has a Master's Degree in history from Moscow University. She speaks five languages: Russian, French, English, Spanish and Italian.

Secondee vacancy in 2012

Carolin Oebel from E.ON Ruhrgas will stay with IGU until the end of August 2012. All members are invited to contact the Secretariat regarding the opportunity of seconding a person with several years' experience in the field of energy to the IGU Secretariat in Oslo. The position will expose the candidate to a wide area of responsibilities and

give them experience of a unique international environment. IGU will cover the candidate's job-related expenses, including travel costs, while the employer of the secondee must cover salary and other costs related to the assignment. The secondment period will normally be for two years.

TI

IGU at UN Climate Change Conferences

The annual UN Climate Change Conference is an important arena for IGU to inform public servants and other delegates about the contributions of the gas industry in moving towards a low-carbon economy and also for addressing gas issues from a climate perspective.

The 2011 Conference, COP17, is being held in Durban, where IGU is organising a symposium on the role of natural gas in the climate change debate on December 4. A similar event was first held during COP15 in Copenhagen in 2009, followed by last year's symposium in the context of the COP16 negotiations in Cancún. The latter was prepared in cooperation with the World-watch Institute.

This year's symposium will highlight how the natural gas industry can contribute to providing access to energy and to mitigating climate change in the context of the broader energy picture. This means considering not just the necessity of providing access to energy to those lacking it today, but also to the rising population that the world has to accommodate in the future.

As the most environmentally friendly fossil fuel, natural gas can make a major contribution to widening access to energy and moving towards a sustainable energy future, in line with UN targets. To reach that potential, building new policy frameworks will be essential. And for that to occur, innovative and strategic cooperation is needed between natural gas, renewables, industrial partners, environmentalists and policymakers.

Readers of this magazine and IGU members who will be attending COP17 in Durban are welcome to register for the event. Please contact Carolin Oebel, Advisor to the Secretary General, via email at coeb@statoil.com or via phone on +47 2253 4383.

CO/SRB

In April, Gazprom Dobycha Yamburg hosted a visit of the IGU Management to Yamal.

IGU Management visit to Yamal, Russia

The IGU President, Vice President, Chairman of the Coordination Committee and Secretary General visited Gazprom assets in East Siberia in April. The programme included visits to the residential and production facilities of Gazprom Dobycha Yamburg, and demonstrated the impressive achievements of Gazprom in maintaining the resource base and enhancing production from this remote region with extreme climatic conditions far away from Russian and European markets.

Meeting with the employees and seeing the facilities have made it easier to understand the unique competence and dedication required to meet the challenges of developing gas reserves located in Arctic regions.

TI

IGU Arctic study tour

The IGU President, CC Chairman, Secretary General and members of the Secretariat visited northern Norway in June to increase their knowledge of gas activities in the Arctic area. The programme included a visit to Statoil's Snøhvit LNG facilities at Melkøya and informative presentations from the Norwegian Polar Institute, the Ministry of Foreign Affairs and a representative from Troms County about the impact and future of gas activities in the far north of Norway.

Seeing the impressive facilities at Melkøya and sharing first-hand experiences of operating gas installations in extreme conditions gave a valuable insight into the possibilities and challenges of gas exploration and production in the Arctic region.

JvD

IGU at international events

ICER-IGU Regulatory Workshop, Washington DC, USA

IGU and the International Confederation of Energy Regulators (ICER) organised a joint workshop on regulatory issues in Washington DC on March 8. IGU and ICER agreed that, where appropriate, market players and energy regulators should seek to work together to improve stability, investments, competition and sustainable growth in the world's natural gas markets. The President stressed that "the gas industry needs high quality and consistent independent regulation if it is to commit the substantial funding needed for new investments". The workshop was the first of its kind and everyone agreed that the two organisations will further strengthen their dialogue and collaboration. For a more detailed report see pages 198-201.

UN Economic Commission for Europe (UNECE), Geneva, Switzerland

Director Hans Riddervold and Carolin Oebel, Advisor to the Secretary General, attended the 64th Session of UNECE in Geneva on March 30. Hans Riddervold addressed delegates on "The role of regional integration and cooperation in promoting sustainable development in the UNECE region". The Commission meets once every two years and is responsible for providing strategic direction on the UNECE programme of work and for conducting policy dialogue on economic developments in the region.

Flame, Amsterdam, The Netherlands

Flame 2011 took place May 9-13 and was attended by the President and Jeanet van Dellen, Advisor to the Secretary General. The President gave a keynote address on the opening day on gas advocacy with the title "Contribution of Natural Gas to a Sustainable Energy Future". Furthermore, he took part in the morning panel session on "The Future of Gas Advocacy", which was chaired by Jonathan Stern of the Oxford Institute for Energy Studies.

European Gas Technology Conference (EGATEC), Copenhagen, Denmark

The President addressed EGATEC2011 delegates on the topic of "Entering the Era of Gas Innovation". The conference is the successor to the European Forum Gas which had been organised under the auspices of Marcogaz, an affiliated organisation to IGU, on an annual basis since 2003. EGATEC2011 was jointly organised by the Danish Gas Technology Centre (DGC) together with Marcogaz and GERG, also an affiliated organisation to IGU, and took place in Copenhagen, May 12-13. For a more detailed report see pages 48-51.

"Energy Dialogue: Russia-European Union", Berlin, Germany

The Secretary General and Advisor to the Secretary General, Carolin Oebel, attended the 6th International Conference "Energy Dialogue: Russia-European Union Gas Aspect" in Berlin, on May 19. The Secretary General addressed delegates on "Natural Gas – Powering the Low-Carbon Economy" in a session moderated by

Torstein Indrebø addresses the 16th EGC in Oslo.

Valery Yazev in his capacity as President of the Russian Gas Society, an Associate Member of IGU and organiser of the conference. Other topics focused on during the conference were international energy cooperation and the outlook to 2050, natural gas – fuel of the 21st century and the impact of the Third EU Energy Package on European and Russian gas industry developments.

Carolin Oebel addresses the 9th RPGC in Moscow.

16th Asia Oil & Gas Conference, Kuala Lumpur, Malaysia

Over 1,000 delegates attended this annual event, organised by Petronas. IGU's President chaired the panel session entitled "Gas Play – Conventional vs Unconventional Gas" on June 7. At the event, the IGU publication "World LNG Report 2010" was officially launched by the Petronas President. This inaugural issue was sponsored by Petronas.

16th European Gas Conference (EGC), Oslo, Norway

The 16th EGC was organised by the Norwegian IGU Charter Member, Norwegian Gas Association, and took place in Oslo, Norway, June 6-7. The Secretary General moderated the first conference session on "Bringing Norwegian Gas to Europe". Key speakers at the conference included the Deputy Minister of the Norwegian Oil and Energy Ministry and Dr Fatih Birol from the International Energy Agency (IEA) who presented the newly released report "Are We Entering a Golden Age of Gas?".

9th Russian Petroleum and Gas Congress (RPGC), Moscow, Russia

The 9th RPGC was held in Moscow, Russia, June 21-23. Together with Gazprom, IGU was one of the Gas Day partners on June 23 and Director, Hans Riddervold co-chaired the morning session entitled "Russia's Gas Industry: Strategies and Prospects".

Advisor to the Secretary General, Carolin Oebel, addressed delegates on "Natural Gas – The Responsible Choice" pointing on the one hand to how natural gas can contribute to a sustainable future and on the other to the need for further communication on this in order to ensure that the political and regulatory framework is set for the industry to be able to undertake the necessary investments.

Photo: Helge Hansen

Successfully developing gas value chains requires a particular habit.

Doing the impossible.

"It can't be done." To us, no other words sound more like a challenge. Working to develop reliable sources of natural gas, we've crossed many frontiers. In 1985, we began transferring gas through a subsurface pipeline from the Statfjord field across the Norwegian Trench for processing at Kårstø, Norway – a seemingly impossible task. We've constructed the world's longest subsea gas pipeline, Langeled, carrying Ormen Lange gas 1,200 km to the north east of the UK. And not to forget the first offshore development in the arctic Barents Sea – the Snøhvit field – developed without surface installations. Wherever it can't be done, we're getting the job done.

Go a little deeper at www.statoil.com

Statoil

Torstein Indrebø, Datuk Rahim and Ho Sook Wah at the Vienna Energy Forum.

Vienna Energy Forum, Austria

For the first time IGU was invited to this Forum which is organised by the United Nations Industrial Development Organisation (UNIDO). The 2011 event, which was held in Vienna, June 22-24, focused on how to solve global energy access and meet the energy poverty challenge as more than 1.5 billion people are still without access to electricity.

The Forum facilitated an international dialogue on providing universal energy access and on the multiple co-benefits of increasing energy efficiency. It featured high-level speakers such as UNIDO Director General Dr Kandeh K. Yumkella and the former Governor of California, Arnold Schwarzenegger. The IGU President participated in a panel debate commenting on the Global Energy Assessment report presented to the Forum and took part in a BBC TV programme discussing global energy access.

The IGU presence gave us the opportunity to promote IGU and natural gas to global stakeholders with limited understanding of what the gas industry can offer in terms of sustainable energy supplies to the world.

EU-Russia Energy Dialogue, Brussels, Belgium

The Secretary General and Advisor to the Secretary General, Jeanet van Dellen, attended the EU-Russia Energy Dialogue in Brussels, Belgium, June 23-24. The conference focused on innovative uses of gas and was organised by the European Commission in cooperation with Eurogas.

Torstein Indrebø, Datuk Rahim and Ho Sook Wah meet the new Secretary General of Eurogas, Beate Raabe (*centre with gift*) at the headquarters of Eurogas in Brussels.

Torstein Indrebø and Jeanet van Dellen outside the offices of the European Commission during their visit to Brussels in June.

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- the two-train Yemen LNG export terminal

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4th Asia LNG Forum, Dalian, China

The Asia LNG Forum is an annual event which brings together decision makers and professionals in the Asian natural gas market. The 4th edition was held in Dalian, July 26-28, and IGU was represented by the CC Chairman who gave a presentation on the "Global Energy Outlook in a Low Carbon Era".

CO

World Shale Gas and Australia Gas 2011

IGU and the CWC Group Ltd will co-host two shale gas conferences this year, Australia Gas 2011 to be held in Sydney, October 31 to November 2, and World Shale Gas to be held in Houston, November 7-11.

Australia Gas 2011 has been created in response to industry demand and will include focused sessions and topics such as project showcases, partnerships, growth opportunities, environmental challenges and international trading, while reinforcing the importance of gas as the fuel of choice globally.

World Shale Gas will gather companies from throughout the world and the value chain to discuss the challenges and opportunities in the shale gas industry worldwide.

CO/SRB

● Gas advocacy

General activities

Gas advocacy is currently a major focus of the IGU work as natural gas still plays a minor role in the energy portfolios of many countries.

To highlight the benefits of natural gas and reach out to the public, politicians and other non-industry stakeholders, efforts have been made by IGU to establish a clear and coherent message on the role natural gas can and should play – especially considering its potential contribution to the mitigation of climate change. There is a need to improve communication and establish the vision for natural gas in a decarbonised world. But it has to be recognised that there are differences in the perception of gas between different regions and economies – particularly when looking at developed versus emerging economies. These differences need to be reflected in the gas advocacy activities of the different regions.

In order to provide a "tool kit" for members that can be used in the context of a customised communication strategy, IGU has published three reports on the IGU website under www.igu.org/gas-advocacy:

- The Gas Advocacy Report;
- The Sustainable Development Work Group Report "Natural Gas: Facts & Figures"; and
- Report on Gas and Climate Change Mitigation.

The Gas Advocacy Report was commissioned by IGU. It includes key messages and identifies the main stakeholders. The five main message categories underline that natural gas CARES for the world, as it is Clean, Affordable, Reliable, Efficient and Secure.

The Sustainable Development Work Group (SDWG) was established at the 2009 Council meeting in Buenos Aires. The main purpose of its report on climate and gas "Natural Gas: Facts & Figures" is to assist in promoting natural gas more actively towards external stakeholders. It is structured as a tool kit for IGU members and offers factual information as a basis for presentations made by members in different countries around the world. IGU regularly updates the information and has recently uploaded the latest version to the website.

The "Report on Gas and Climate Change Mitigation" was prepared by Comgás Natural.

Gas advocacy at the Executive Committee meeting, Brazil

A full-day workshop on gas advocacy was held during the last Executive Committee meeting in Rio de Janeiro, Brazil, April 5-6. Communication experts from the industry presented different

cases and guidelines for communication with relevant stakeholders.

Kevin Murphy of ExxonMobil focused on communication with policymakers and emphasised the need to enhance the coordination and effective implementation of advocacy strategies as well as the focus on core messages.

Hansch van der Velden of Gasunie presented the Dutch experience and related key findings. These included, for example, that facts are not the same as messages, that it is important to find and create momentum for messages and that more focus needs to be put on corporate social responsibility.

Mel Ydreos of Union Gas Ltd, Canada, reported on some discussion points raised during the World Bank Energy Week in which he participated as an IGU representative. One point was that the industry needs to highlight the differences of natural gas compared to other fossil fuels and to further elaborate on the full life cycle assessment.

After the presentations the EXC members discussed priority areas for gas advocacy in the following regions: Africa and the Middle East, Europe and the CIS, Asia-Pacific and North and South America.

There will be a similar workshop during the meetings of the Council and EXC in Dubrovnik, Croatia, October 3-7.

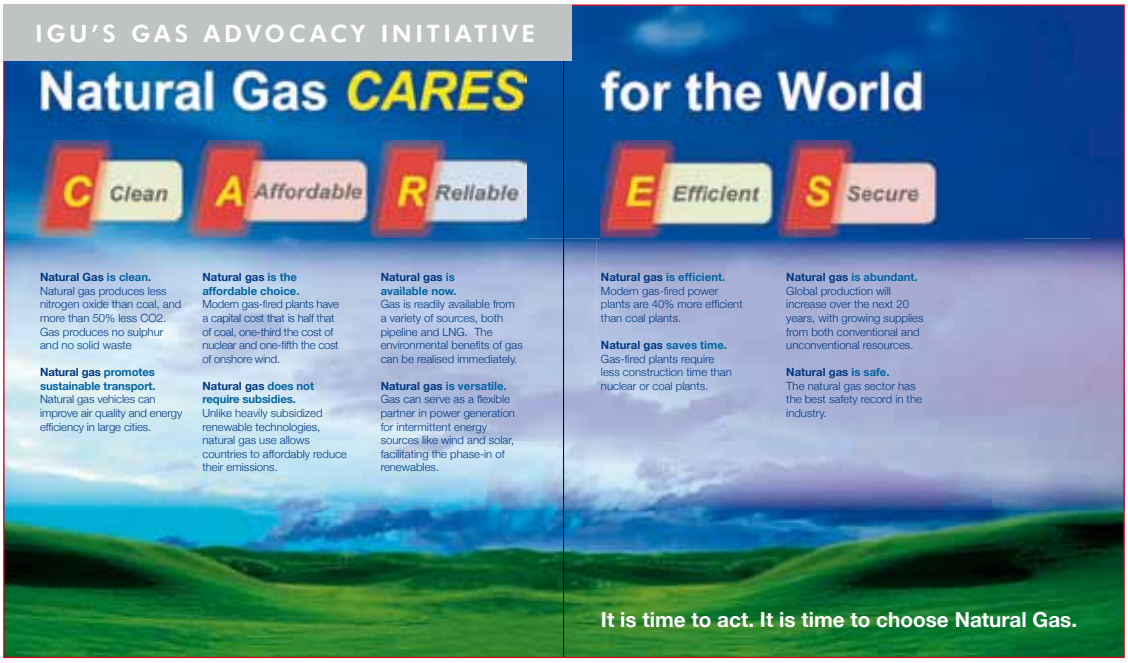
HR/CO

● Activities related to current European politics

European policymakers are working on the Energy Roadmap 2050 to be published by the end of this year. The Roadmap is expected to establish guidelines for discussion of the future energy mix in Europe, and is expected to have a significant impact on the European energy industry.

IGU is cooperating with other gas associations based in Europe (Eurogas, GIE, GIIGNL, Marcogaz and the International Association of Oil and Gas Producers – OGP) to ensure that natural gas is well represented in the debate in Brussels and promote natural gas as a sound alternative in a sustainable European energy future.

JvD



Erik says "au revoir"

I had my first experience of an IGU event in 2006, when I went to the 23rd World Gas Conference in Amsterdam as part of the exhibition team from Norsk Hydro. Unfortunately I had no time for the conference itself so I particularly appreciated being able to attend the next WGC in Buenos Aires in 2009 as part of the IGU team. Finally, I too could enjoy the conference atmosphere and take part in the sessions where important gas topics were discussed among key stakeholders in the global gas industry.

Working in the IGU Secretariat from November 2007 to June 2011 was a great journey for me. I enjoyed gaining a global perspective on the gas business and participating in the unique network that IGU offers. The members, affiliated organisations and other contacts were always supportive when discussing communication issues, and I hope that that all of you were happy with the service provided during my term as Senior Advisor & Press Contact.

During my term there were many important IGU events in addition to WGC2009, and I would like to highlight the 1st and 2nd IEF-IGU Ministerial Gas Forums and the COP15/16 Gas Events. They were very demanding resource- and time-wise but, based on the feedback from delegates and the high-level participation we were able to secure, I feel confident that IGU will continue to deliver high-quality events for the remaining period of the Statoil-hosted Secretariat.

Erik Gonder played a key role in establishing an IGU gas event during the UN Climate Change conferences. Here he is at COP16.

In my new position in Statoil as Investor Relations Officer, I have already had several discussions with investors and analysts about European and global gas markets from a climate change perspective. This tells me that IGU is on the right track when focusing more on geopolitics and climate change mitigation.

I would like to thank all the colleagues with whom I have worked, including the members of the Executive Committee and the Council, and of course the Argentine and Malaysian Presidencies. A special thanks to the Secretary General and the team in Oslo.

I hope that our paths will continue to cross, and I wish you all the best for WGC2012 in Kuala Lumpur. I also send my best wishes to the incoming French Presidency for their planning of WGC2015.

EG

Jeanet says farewell

After more than two and a half years' secondment to IGU, I will return to Gasunie in November and would like to take this opportunity to look back at my time in the Secretariat.

During a challenging time for the gas industry, it has been fascinating to work on a diverse range of activities such as writing speeches, preparing IGU meetings, managing the IGU Gas Awards and giving presentations at international conferences.

The tasks assigned to me evolved in line with the development of IGU's activities and my own experience. From the beginning of my secondment, I have been supporting the Policy Committee of the IGU Research Conference (IGRC) in its work, including the election for the 2014 host and the further embedding of IGRC into the IGU organisation.

Another highlight for me was the 2nd IEF-IGU Ministerial Gas Forum held in Doha on November 30, 2011. The wide scope of the project, the cooperation with colleagues from IEF and the interaction with both policymakers and industry was inspiring.

At the moment I am participating in the Joint Gas Advocacy Programme towards the European Energy Roadmap 2050. In this initiative IGU is cooperating with other European-based gas associations to advocate for the role of natural gas in Europe's future energy landscape.

It has been a privilege for me to be part of IGU and work in such a truly global environment with people from many different nationalities and backgrounds who all have been very generous in sharing their knowledge.

I am grateful for the steep learning curve which the secondment programme has offered me, both for my professional as well as my personal development.

I would like to thank all of you with whom I have worked. A special thanks to colleagues from the Argentine and Malaysian Presidencies for your great cooperation. Although you are on the other side of the world it has always felt as if you had offices next door!

It is good to look back, but I prefer looking forward. At the time of writing I still have a busy schedule with the IGU meetings in Dubrovnik, IGRC2011 in Seoul and the work for the Joint Gas Advocacy Programme in Brussels. I hope to see you at one of these events and be able to thank you personally for having had the chance to work together.

After leaving the Secretariat I will not leave IGU completely behind as I am a member of WOC 3 – Transmission. I hope that our paths will cross in the future and I am looking forward to meeting you again in Kuala Lumpur or in my new position in Gasunie.

JvD

● IGU Strategic Statement 2011

The Executive Committee approved the Strategic Statement for 2011 during its meeting in April. The Statement has now been published under the title *Natural Gas for a Sustainable Energy Future*.

SRB

IGU STRATEGIC STATEMENT 2011: NATURAL GAS FOR A SUSTAINABLE ENERGY FUTURE

Natural gas is the cleanest fossil fuel making it a unique choice in the path towards a lower carbon energy future. The abundance of natural gas, its competitive cost of supply, the availability of proven gas technology and the flexibility to work as a partner with renewable energy, all favour natural gas as the best energy source to address carbon emission reductions at the lowest cost.

The world continues to face the challenge of providing the energy needed to sustain growth, whilst addressing environmental concerns resulting from intensive use of fossil fuels.

In the coming decades natural gas should emerge as the leading fossil fuel, with an increased share of the global energy market. At the same time, governments are increasingly focusing their energy policies towards the reduction of greenhouse gas emissions by the promotion of renewable energy (or nuclear energy) with the objective of developing other major energy sources.

Given this outlook the International Gas Union is working proactively with governments, regulators and the gas industry stakeholders to:

- Promote switching to natural gas in the power generation and industry sectors;
- Encourage the use of natural gas in the transportation sector; and
- Motivate all parties to improve efficiency and strive for best practices throughout the value chain.

This can be done now through the use of readily available and proven gas technologies that will continue to help to achieve the reduction of atmospheric levels of greenhouse gases in the medium and long term.

In line with its mission, the International Gas Union will continue to:

- Promote the exchange of knowhow within the industry catalysing the development of new technologies;
- Act as an effective interface between industry and government informing about the advantages of natural gas; and
- Monitor the development of energy policies and public opinion to enable the gas industry to anticipate and prepare for both threats and opportunities.

Natural gas is an integral part of our sustainable energy future.

Reports from the Regional Coordinators

The IGU Council approved the appointment of Regional Coordinators during its meeting in Buenos Aires in October 2009 and the Executive Committee subsequently elected four people to the new positions. Each has been invited to write a short report for the IGU Magazine.

● Africa and the Middle East

By Khaled AbuBakr

One of the focuses of IGU during the current Triennium is on developing countries in Africa and the Middle East. Being elected Regional Coordinator was both an honour and a challenge due to the nature of these underdeveloped countries and the vast resources they hold.

In the region we have focused on workshops and conferences to connect us as regional players while sharing knowledge and debating issues. Hosting such events in different countries has given us the opportunity to meet colleagues and share experiences related to the industry.

Khaled AbuBakr (*second right*) at the Geopolitics and Natural Gas roundtable in Muscat with HE Nasser bin Khamis Al Jashmi of the Omani Ministry of Oil & Gas (*second left*). They are flanked by IGU's President, Datuk Rahim Hashim (*left*), and the CC Chairman, Ho Sook Wah (*right*).

In October 2010, Qatar hosted the meetings of the Executive Committee and Council in Doha and three workshops were held:

- "Recruiting and Retaining Talent in the Gas Industry: Challenges and Opportunities in the Middle East";
- "Natural Gas as Catalyst and Energy Source for Industrial Development"; and
- "Improving IGU's Advocacy of Natural Gas".

Other events

Other events in the region included:

- The 12th Tunisian Exploration and Production Conference "Focusing on Frontier Exploration and New Geological Targets", Tunis, Tunisia, October 2010;
- The 2nd IEF-IGU Ministerial "The Role of Natural Gas in a Sustainable Energy Future", Doha, Qatar, November 2010;
- "Creating Awareness of Natural Gas to Increase Demand", a paper I gave at the Natural Gas Distribution Conference in Ankara, Turkey, November 2010;
- Task Force 3 roundtable "Geopolitics and Natural Gas in the Middle East and North Africa", Muscat, Oman, April 2011; and
- The 2nd Annual Middle East and Africa Gas Distribution Summit, Cairo, Egypt, May 2011.

We cannot deny that the recent revolutions and political unrest in the region have highlighted a major dysfunction in the gas industry as well as an absence of democracy. Some regimes agreed unfair gas export contracts to gain short-term or personal benefits.

Developing an international legislative mechanism to govern long-term gas contracts was one of the major outputs of the Task Force 3 roundtable held in Oman, which would help solve many geopolitical issues involving countries in Africa and the Middle East as well as in all regions around the world.

I am very privileged to be part of IGU and see our main aim as working for a better quality of life for all the world's citizens. As Regional Coordinator I will work to encourage other non-active members in the region to enrol in more workshops, roundtable meetings and other forms of discussion.

Khaled AbuBakr of TAQA Arabia is the Regional Coordinator for Africa and the Middle East.

Asia and Asia-Pacific

By James Kwan

Since taking up the role of Asia and Asia-Pacific Regional Coordinator, I have been using two platforms to contribute to gas industry development in the region, namely the Gas Information Exchange in the Western Pacific Area (GASEX) and the Hong Kong and China Gas Company Limited for which I work.

GASEX

Since its foundation at a meeting held in Hong Kong in December 1989, GASEX has been serving its members as a forum for the exchange of information and best practices. There are currently Charter Members from 15 economies (see box), representing good coverage of the region although recruitment continues. All the economies represented in GASEX are also represented in IGU except for New Zealand, Papua New Guinea and the Philippines.

GASEX organises a biannual conference and exhibition, which makes an important contribution to sustainable development of the regional gas industry. This was first staged in 1990 and the 11th edition was held in Taipei, October 24-26, 2010.

The theme for GASEX2010 was "Pursuing a Cooperative Paradigm for Energy, Environment and the Economy". Some 600 delegates discussed the latest information on various topics such as the outlook for the global gas market, the status of the natural gas industry (both upstream and downstream activities) in various countries and regions, the progress of gas projects in the Western Pacific region and elsewhere in the world, and the latest news on technological developments and environmental issues.

Conference delegates came mainly from the 15 member economies. I passed on the key conclusions to the wider IGU audience through the Union's regular meetings and workshops.

ABOVE
James Kwan.

People development

The gas market in China is growing and so is the need for talented gas professionals. As well as developing its business activities, my company has been playing an active role in people development.

In March, the Hong Kong and China Gas Company Limited's technical training facility, Towngas Engineering Academy and the UK Institution of Gas Engineers and Managers launched the "Technical Report Option". This is a tailor-made scheme for Chinese gas engineers who lack the full benchmark academic base to demonstrate that their professional engineering experience is equivalent to an internationally-recognised professional qualification.

ECONOMIES REPRESENTED IN GASEX

Australia
Brunei
China
Hong Kong, China
Japan
Korea
Indonesia
Malaysia
New Zealand
Papua New Guinea
Philippines
Singapore
Taiwan, China
Thailand
Vietnam

An experienced mentor from a similar engineering discipline and background has been assigned to each mentee, aiming to share his or her knowledge and provide guidance during a two-year period of structured supervision.

My company is also working with two of the Task Forces set up under the current Malaysian Presidency of IGU.

In August 2010, we hosted the second meeting of Task Force 2, which is working on initiatives to arouse the interest of young people in science and engineering subjects.

In September, we presented a paper on "Challenges in attracting and retaining talent in Hong Kong and Greater China" at a workshop organised by Task Force 1, which is looking at how to build strategic human capital.

I look forward to continuing my work as a Regional Coordinator.

James Kwan of Hong Kong and China Gas Company Limited is the Regional Coordinator for Asia and Asia-Pacific.

ABOVE
Marcel Kramer.

Europe and the CIS

By Marcel Kramer

What does Rubens have in common with natural gas? Those of you who have read the draft of the EU Roadmap 2050 for a low-carbon Europe, may think of the "Massacre of the Innocents", one of the famous masterpieces of the painter-diplomat.

The connection is much simpler though: the Hermitage Museum in Amsterdam was hosting a special exhibition of Rubens in September. And our last IGU Geopolitics and Gas Forum, this time dedicated to Europe and the CIS region, was due to take place in the same city on September 30. A visit to the Hermitage was in the programme!

The organisation of the Forum, or of the CEO's roundtable, as we at IGU call it, had been receiving my primary attention in the previous months. I would like to take advantage of this opportunity to thank everybody involved in the organisation for their help and energy. It is, indeed, not so easy to bring together so many high-level personalities – CEOs, experts and senior policymakers. And the Forum was an excellent opportunity to reflect on the most recent European and CIS developments through geopolitical lenses. Be it the changes in nuclear policy in some European countries, the new large-scale infrastructure projects in Europe and the CIS or international energy relations, geopolitics related to gas is always topical, complex and delicate. Indeed, it is also one of the central themes to be debated at the 25th World Gas Conference, which will take place in Kuala Lumpur in June 2012.

I very much support the new initiatives within the IGU framework. The Programme Committee covering marketing and communication (PGC E) is just one of these rather recent cooperation schemes. As Bernard Shaw once said, "The single biggest problem in communication is the illusion that it has taken place". IGU, for instance, has assembled a comprehensive and persuasive dataset on natural gas fact and figures. But is the "voice of gas" really heard by policymakers and also by the broader public? Should we work further in order to ensure a regular participation in our meetings by, for instance, EU representatives? Should we diffuse our work among the general public, for example, starting from students? I have seen that the latest communication meetings have proved very valuable as a platform for generation and exchange of ideas and strategies, and I am pleased to support this important work.

One of my inspirations for the following months is also to further expand the IGU

In order to ensure energy supply for Central and Eastern Europe - OMV is investing in projects with future potential. Not only this region will benefit from the planned construction of the Nabucco Gas Pipeline transporting gas from Azerbaijan to Europe - but so does the rest of Europe. OMV also is investing in gas storage projects and in LNG projects to increase security of supply.

Move & More. OMV

membership. Indeed, some countries from Europe and the CIS, several of which are increasingly important gas producers and consumers, have not yet been integrated into the IGU framework. We are now in the process of establishing the necessary contacts. I would be very happy to welcome new participants from this region.

It is quite challenging to illustrate all activities and goals as an IGU Regional Coordinator in a short article. What I would like to point out is that this task is not only a fascinating experience, but also a responsibility. We must move IGU forward for the benefit of its members and for secure, stable, cleaner and affordable energy supply. The Regional Coordinators can make a contribution to that and I am pleased to do so.

Marcel Kramer of South Stream is the Regional Coordinator for Europe and the CIS.

North and South America

By João Carlos de Luca

As IGU's North and South America Regional Coordinator I have observed that the use of natural gas is becoming even more important in the region. Thanks to its environmental qualities as the cleanest of the fossil fuels, the discoveries of important new reserves such as the unconventional reserves in the USA and in some South American countries, and also the promising developments of the pre-salt play in Brazil, natural gas is becoming the fuel of choice in the Americas.

Due to IGU's relevance as the main voice of the global gas industry, we have talked with relevant natural gas organisations in South American countries, such as Colombia and Bolivia, to encourage them to join the Union.

So far during the 2009-2012 Triennial Work Programme, the following IGU meetings have been held in Rio de Janeiro, Brazil:

- The first triennial meeting of Programme Committee C – Gas Markets (February 2010);

João Carlos de Luca.

- The third triennial meetings of Working Committee 3 – Gas Transmission (February 2011) and Working Committee 1 – Exploration and Production (March 2011);
- The first 2011 meeting of the Executive Committee (April); and
- Task Force 3's South American Roundtable Forum on Geopolitics and Natural Gas (August 2011).

The conclusions of the Task Force 3 roundtable, which will be reported in the next issue of the IGU Magazine, will make an important contribution to my role as Regional Coordinator.

João Carlos de Luca of the Brazilian Petroleum, Gas and Biofuels Institute (IBP) is the Regional Coordinator for North and South America.

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THE SECOND BRIDGE ORINOCO RIVER

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WATERS OF PARANA RIVER

EXPANSION OF THE CAPACITY OF GAS TRANSPORT

PIPELINE
GENERAL SAN MARTÍN

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News from Organisations Affiliated to IGU

In this issue, we start with a review of EGATEC2011, which was organised by the Danish Gas Technology Centre (DGC) under the joint auspices of the European Gas Research Group (GERG) and Marcogaz, followed by a separate item on GERG's 50th anniversary.

Then we have reports from the Energy Delta Institute (EDI), Gas Technology Institute (GTI), International Pipeline & Offshore Contractors Association (IPLOCA), NGV Global (International Association for Natural Gas Vehicles) and Russian National Gas Vehicle Association (NGVRUS).

● EGATEC2011 – The Future of Gas is Green!

By Jan Jensen and Jean Schweitzer

The first European Gas Technology Conference (EGATEC) was held on May 12 and 13 under the joint auspices of Marcogaz, GERG and the Danish Gas Technology Centre which hosted the event.

The first keynote speaker, Datuk Abdul Rahim Hashim, President of IGU (*left*), and conference host, Peter I. Hinstrup, President of DGC, ready to open EGATEC2011.

Key conclusions

The conference concluded that the natural gas system will play an important role in the future energy mix, the major reasons being:

- Gas reserves have grown significantly over a short period of time;
- The gas network is suitable for the transportation of "green" gases; and
- The gas system has the buffer and storage capacity necessary to integrate increased electricity production from solar and wind power.

A well-functioning gas system, therefore, is a prerequisite for both energy security and the integration of renewable energy (RE) in the energy system of the future.

The challenges are the large number of decentralised gas production sites, variations in gas quality, the interaction with electricity production and consumption as well as the creation of smart gas grids that can handle the integration of RE gases, settlement and excess electricity production.

The conference

Some 260 people from 25 countries participated in EGATEC2011. Since GERG is celebrating its 50th anniversary this year, the GERG Academic Network contributed to the conference with a poster exhibition and papers.

The main sponsors were DONG Energy, HMN Naturgas and Naturgas Fyn. The co-sponsors were GDF SUEZ, Energinet.dk, E.ON Ruhrgas, IGU, Kema, Københavns Energi, Naturgas Energía and Svenskt Gastekniskt Center (SGC).

With the overall theme "Gas Innovation for a Greener Europe", the two-day conference included plenary sessions with keynote speeches, a round-table, a poster session and five parallel sessions covering specific themes. There was an exhibition in which 10 selected companies showcased their commitment to a greener Europe with natural gas, and two technical visits were organised: one to the Sjölunda sewage and biogas plant in Sweden, and the second to the Avedøreværket combined heat

and power (CHP) plant in Copenhagen.

Keynote speeches

The conference was opened by Datuk Abdul Rahim Hashim, President of IGU, who stressed that gas is more than a transition fuel and has a key role to play in future energy supply. If reserves of unconventional gas are taken into account, natural gas will last for 260 years, the same time-frame as for coal. Moreover, natural gas offers an attractive possibility to quickly and easily reduce CO_2 emissions from electricity production: they could be halved just by replacing coal with natural gas.

Anders Eldrup, CEO of DONG Energy (LEFT), Simon Blakey of Eurogas (CENTRE) and David Carroll, President and CEO of GTI (RIGHT).

Anders Eldrup, CEO of DONG Energy, gave the international audience an explanation of how DONG Energy will "invert the fraction" so that future electricity production is based on 85% renewable sources (as opposed to a current 15%).

Simon Blakey of Eurogas discussed the contribution of natural gas to the fight against climate change.

David Carroll, President and CEO of the US Gas Technology Institute (GTI), gave a presentation on unconventional gas with a focus on shale gas resources which can be recovered via hydraulic fracturing (fracing), where a mixture of water, sand and chemical additives is injected into the well to break up the shale rock. This extraction technique has quadrupled the known reserves of natural gas but there are concerns about its environmental impact. Indeed, the French Parliament banned fracing in France during EGATEC2011.

Klaus Altfeld of E.ON Ruhrgas and the Immediate Past President of GERG presented a number of contributions GERG has made to the development of the gas industry over the past 50 years.

Parallel sessions

The first session "Smart gas: a reality for the gas industry?" was chaired by Daniel Hec of Marcogaz.

The introduction of smart meters has been identified as a key means of helping European

GERG's Immediate Past President Klaus Altfeld (left) with the current GERG President Enrique Palomino Bilbao (right) and the President of Marcogaz, Carlos Villalonga (centre), who chaired the last plenary session. In the foreground is Dave Pinchbeck, General Secretary of GERG.

The panel sessions were chaired by Daniel Hec of Marcogaz (ABOVE LEFT), Jørgen Held of SGC (ABOVE CENTRE), Sigbjørn Svenes of Statoil (ABOVE RIGHT), Pleun Schuddebeurs of Gasunie (FAR LEFT) and Stephan Ramesohl of E.ON Ruhrgas (LEFT).

consumers to better manage their energy consumption. Directives in the third EU legislative package for Europe's gas and electricity markets fix challenging targets for the roll-out of smart meters. Regarding smart grids, the current discussion at EU level mainly concerns the electricity sector, but the gas industry is working on smart gas grids in combination with the electricity industry to prepare the energy grids of the future.

There were two presentations on smart energy grids: intelligent energy nets in Denmark by Kim Behnke and European work on smart gas grid issues by Jos Dehaeseleer. The importance of standardisation to ensure interoperability of the smart metering systems being deployed was stressed by Ralf Hoffmann. Results from a French project on automatic meter reading were analysed by Alain Désandré. And promising new ways to store electricity in gas grids in Germany were explained by Klaus Altfeld.

The second session "Biomethane technology for a greener Europe" was chaired by Jørgen Held, CEO of SGC.

This was the longest session, lasting a whole day. The German and Swedish experience with injection of biogas into the natural gas grid was highlighted, while other presentations focused on cleaning techniques and trace elements in biogas. Gøteborg Energi also presented the progress of the Gothenburg Biomass Gasification project (GoBiGas), which will produce biogas with a quality comparable to natural gas to enable the two types of gases to be mixed in the gas network.

The third session "Opportunities for the gas industry in CCS?" was chaired by Sigbjørn Svenes of Statoil.

Different topics were presented and discussed such as field experience and pilot projects, the transport and storage of CO_2 and pipe integrity with CO_2 transport.

The fourth session "Asset management, a new approach" was chaired by Pleun Schuddebeurs of Gasunie.

Topics in this session ranged from asset management for gas infrastructure to projects such as the automatic aerial surveillance of pipelines.

The fifth session "New green gas technologies for domestic and commercial use" was chaired by Stephan Ramesohl of E.ON Ruhrgas.

Several presentations highlighted fuel cells as the technology of the future for micro-CHP, primarily because fuel cells produce electricity and heat at a ratio that is very suitable for domestic consumption.

However, gas-fired heat pumps may well be the next technology for the gas market and the industry's answer to counter competition from electrical heat pumps in the EU. Japanese products have been available for several years and now two European products are on the market.

Roundtable and posters

A roundtable discussion chaired by Marc Florette was organised to discuss the role of natural gas in the renewable energy future. One of the conclusions was that the gas industry should work to increase the visibility of new gas technologies.

Posters focused on the production of biogas and hydrogen and the integration of these gases in the natural gas system.

The GERG Academic Network, which normally takes place in Brussels, formed part of the conference with a high-quality poster exhibition. First prize was awarded to Eric Cloarec, Université de Pau et des Pays de l'Adour for his poster describing his PhD topic: "Experimental studies of solubility of elemental sulphur in methane".

Jan Jensen is Executive Vice President of the Danish Gas Technology Centre and Jean Schweitzer, who was the Chairman of IGU's Working Committee 5 during the 2006-2009 Triennium, is Project Manager at DGC. The EGATEC programme, papers and posters can be found at: www.egatec2011.dk/programme.htm.

Marc Florette, Senior Vice President of Research and Innovation, GDF SUEZ, chaired the roundtable session that included (*seated from left to right*) Enrique Palomino Bilbao, GERG President; Hisao Watanabe, Senior Executive Officer, Tokyo Gas, Bjarke Pålsson, CEO, Naturgas Fyn; and Jeremy Bending, Director, Distribution Network Strategy, National Grid.

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IGU President Datuk Abdul Rahim Hashim, getting into the swing at the GERG 50th anniversary celebrations.

GERG Celebrates 50th Anniversary

By Dave Pinchbeck

GERG, the European Gas Research Group, is celebrating its golden jubilee in 2011, marking 50 years of promoting collaborative R&D in a European gas industry which has responsibility for supplying some 115 million domestic, commercial, industrial and power station gas customers connected to the EU27 natural gas grid.

GERG was founded in 1961 to strengthen the gas industry within the European Community by enabling exchange of information between specialist R&D centres to avoid duplication of effort. GERG has been a Brussels-based organisation since 1996, with emphasis on maintenance of links with the EU institutions, lobbying for recognition of the importance of natural gas-related R&D and providing support to members applying for EU funds for collaborative projects.

Leading players from the European gas research community joined representatives of the European and major international gas institutions, at a celebration dinner held in Copenhagen on May 11 to mark the 50th anniversary of GERG.

The event was hosted by the Danish Gas Technology Centre as part of the EGATEC2011 conference, under the auspices of GERG and its President, Enrique Palomino Bilbao, Director General, Liberalised Business, Naturgas Energía. Invited guests included retired GERG past-Presidents, representatives from Eurogas and Marcogaz and, from as far afield as the USA, Japan and Malaysia, notably Datuk Abdul Rahim Hashim, President of IGU and the Malaysian Gas Association (MGA).

GERG represents the interests of the key technology players in the European gas industry and provides a large reservoir of specialist knowledge and a high quality research resource through its members, many of whom are international leaders in their field. GERG's priorities remain: technology and innovation; networking; technical information exchange; and the promotion of collaborative projects in crucial areas such as: security of supply; gas transmission, storage and distribution; utilisation; environmental protection; and safety, among others.

Dave Pinchbeck is the General Secretary of GERG (www.gerg.eu).

Energy Delta Institute: Empower your Business, Share the Energy of Knowledge

By Eric Dam

With the establishment of the Energy Delta Institute (EDI) in 2002, a platform for the development and exchange of energy knowledge was created. This is the cornerstone on which we have built our extensive training programme to educate the energy leaders of today and tomorrow. Since then, partners and participants alike have joined our network to meet one another, share their views and exchange knowledge. Many industry partners have joined EDI, all contributing to the world's largest energy knowledge network. EDI intensifies its partner contacts and the contact between partners through various activities such as regular

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REN operates the Portuguese transmission systems for natural gas and electricity, including an LNG Terminal at Sines and an underground storage facility. REN is one of the few combined electricity and natural gas TSO in Europe.

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Portugal's geographic location and the capabilities of the Portuguese natural gas system, makes us a privileged gateway to the European market. Experience and commitment with quality have made us one of the most efficient operators in Europe.

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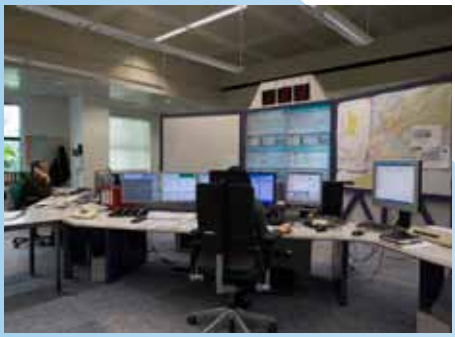

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EDI's new President, Eric Dam, was a member of Gasunie's Executive Board and Director Construction & Maintenance between 2005 and September 2011. Prior to 2005, he held various positions in Gasunie.

roundtables and conferences. It provides energy executives with an opportunity to enhance their knowledge and strengthen their network, both personally and professionally. Additionally, EDI organises special events for ambitious young professionals, also with a focus on knowledge and networking.

With effect from October 1, I will become President of EDI and am looking forward to taking up my new post. I have always been a staunch supporter of investment in knowledge, and chaired the Executive Board of EDI from 2002 to September 2011. The changing energy world is forcing energy companies to innovate in order to stay competitive. In addition, the energy sector is confronting the possibility of a growing shortage of qualified personnel in the coming decades. The sector has only one choice: to invest in knowledge. EDI is instrumental in bridging the knowledge gap in the industry, especially now that many senior experts are starting to leave.

The cross-fertilisation which takes place at EDI makes our knowledge facility one of a kind. Our strength is the diversity of the courses, partners and participants. We are proud to have attracted more than 220 lecturers with wide-ranging and in-depth experience from their active professional lives in the energy sector. They are instrumental in transferring their knowledge to succeeding generations of energy professionals and management through EDI's structured and supported programmes.

Founding and associated partners

In 2002, NV Nederlandse Gasunie, GasTerra BV, OAO Gazprom and the University of Groningen founded Energy Delta Institute. They were later joined by Shell. These organisations are the founding partners of EDI.

To ensure our products and services meet the demands of the energy sector and are of the highest quality, EDI cooperates with a number of parties in the business and knowledge sectors. In order to realise our mission and vision, we are expanding the network of business partners, known as associate partners. Our present and future associate partners are active players in the international energy market. Currently, Essent, DONG Energy and Energie Beheer Nederland (EBN) are associate partners.

The founding and associate partners get together annually during EDI's International Supervisory Board meeting to discuss the Institute's progress and plans and strengthen their mutual bonds.

Network events

Sharing the "Energy of Knowledge" is not only conducted between and among our business partners, EDI also provides energy professionals with opportunities to meet one another. For that purpose we organise a variety of events, conferences, seminars and roundtable discussions. In short, EDI contributes to an "Energy Community" in which the knowledge, development and networks of energy organisations are shared. A good example of these efforts is the annual EDI Autumn Conference focusing on energy transition.

Young professionals

EDI also offers a meaningful platform for young energy professionals. The energy industry is a crucial sector in the world economy – a sector that needs a constant influx of young professionals, because it is presently threatened by an ageing working population. New blood and new energy are needed. Today's new young professionals will be the future captains of industry. The energy world wants to inspire the smartest and the brightest among young professionals who want to make the most of their career. This is where EDI comes in.

EDI offers a platform where energy professionals can gain academic knowledge and business knowhow, obtain information and exchange views with peers from the industry. EDI regularly organises special events for ambitious young professionals. Such events always focus on two main aspects, knowledge and networking. As far as knowledge is concerned, EDI challenges the minds of young professionals with fascinating presentations as well as exciting simulation games to bring out the best in them. During the events participants have every chance to meet relevant people from the energy world to exchange views, obtain information and discuss plans for the future, both at a personal and business level.

Executive education

EDI offers a coherent and comprehensive package of training programmes that focus on the economic, managerial, technical and geopolitical aspects of the energy business. As an energy business school we offer the best of two worlds. We are fully equipped to develop customised training programmes from a business perspective and on energy-related issues. We are capable of moulding any topic of interest for your company and its employees into a programme suitable for your company's specific needs. In addition, our broad range of open courses comprises different levels of education: Introduction Programmes for

EDI's partners get together annually during the International Supervisory Board meeting – last year's was held in St Petersburg in October 2010.

starters, Specific Programmes designed to enhance knowledge in specific areas, and Executive Master and Leadership Programmes preparing participants to take up higher management positions.

Knowledge hub

EDI's in-house Intelligence Unit is a knowledge hub supporting the continuous development of our educational programmes. It also collects, transforms and summarises new energy knowledge and distributes it to the business community and the EDI partners in particular. It thereby acts as a source of information on the latest fundamental and applied research results from the academic community and the business world. The data are stored and distributed in various, mostly electronic publications, which can be used as a reference tool by interested parties.

Best practices – EBC Fellowship on Energy Programme

The European Business Congress (EBC) is an influential non-governmental and non-profit organisation striving for the development of, and cooperation between, members of the Organisation for Security and Cooperation in Europe. EBC provides a platform for a sustained dialogue across borders between different cultures and mentalities. This dialogue is conducted at congresses and within EBC's seven working groups that reflect important economic topics. EBC works closely with the European School of Management and Technology in Berlin, Germany.

The Human Resources, Education and Sciences working group recognises that energy is an integral part of our society and that the outcomes to the challenges within the energy sector also affect other business areas. However, the goals of different parts of the European continent are not always aligned. Two decades after the fall of the Berlin Wall, the need for cooperation in Europe is higher than ever if the European economy wants to compete on a global scale. All these challenges call for new leadership and innovative ways to match future energy supply and demand in Europe. New leaders in the European energy sector will hopefully find solutions that are beneficial for the whole continent and not just their own countries or companies. To do so, they should understand the drivers, cultures and goals of the different European regions.

In the spirit of EBC, this will result in new solutions that bring prosperity to the whole of Europe. With the Fellowship on Energy Programme, EDI has created a unique programme to facilitate a new generation. EBC is adamant about the value of the Fellowship on Energy Programme for the energy sector. It will add to a shared experience and I trust it will help decision-makers to see that cooperation is necessary for further development.

Best practices – EDIAAL

EDI recently launched its new Energy Transition Programme called EDIAAL. It is devoted to the development and organisation of training programmes, seminars and other events, as well as various digital information tools for sharing knowledge on the role of gas in a sustainable low-carbon economy. EDI is working on the creation of a wide knowledge base on gas and energy transition.

EDIAAL will focus on informing the energy industry and other stakeholders, and the players in Northern Netherlands in particular. The aim over the next four years is to develop EDIAAL into a leading source of information and intelligence about the changing role of gas. EDIAAL is partly made possible by a subsidy granted by the Northern Netherlands Provinces (SNN) and is co-financed by the European Union, European Fund for Regional Development and the Dutch Ministry of Economic Affairs.

Eric Dam is the President of EDI (www.energydelta.org).

2010

Solar power

2011

and, for when the sun isn't out...

2012

2013

2014

2015

2016

2017

2018

2019

2020

2021

Natural gas

2022

2023

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2027 . . .

● Technology is Key to Meeting Today's Global Gas Challenges

By Rod Rinholm

The time for natural gas is now

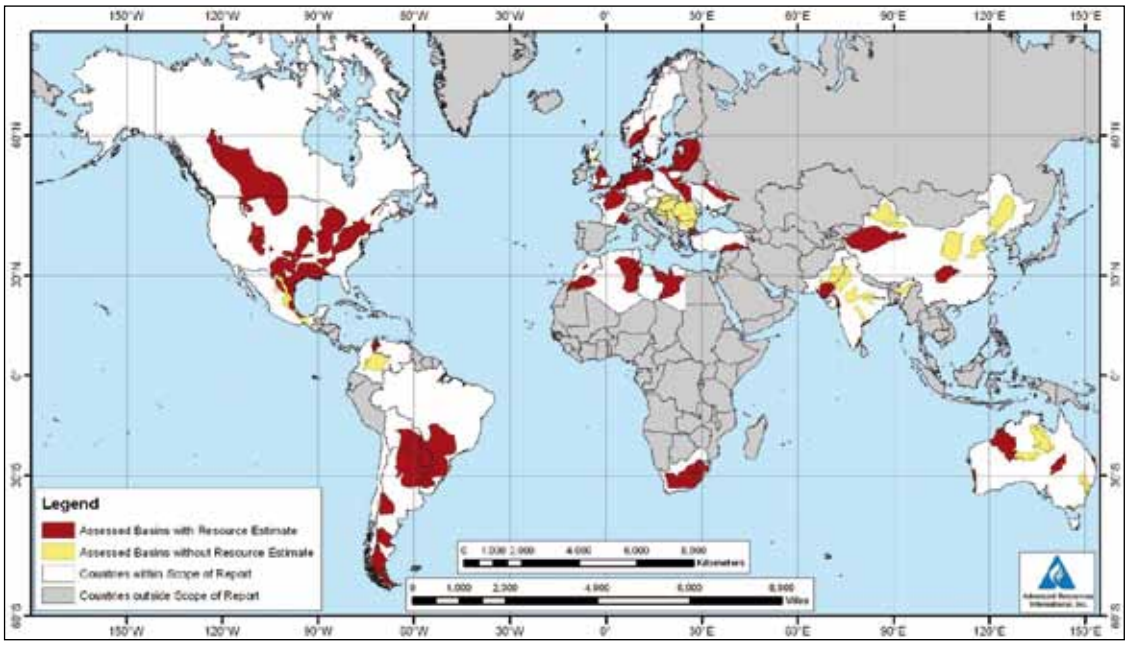
With significant expansion in gas supplies from unconventional sources in North America – and prospects for similar growth in other parts of the world – all signs point to a future in which natural gas will play a leading role in the global energy mix.

New market opportunities for natural gas abound around the world. In North America, the power generation sector will provide new growth opportunities for gas as older, coal-fired power plants are retired. The US transportation sector is also seeing growth in demand for abundant, clean and affordable natural gas as an expanding number of vehicle options enter the market. And, as the applications of natural gas expand beyond that of use as a transition fuel, there is great potential for strong international market growth.

Along with growing global demand for natural gas, there is a correlating demand for new technologies to enable and ensure its responsible production, distribution, and use. Gas Technology Institute (GTI) is an integral player for many of these technology areas, and we are increasingly connected with other organisations interested in common issues. We are leveraging our strengths and learnings in North America to contribute to solutions for the global energy industry.

Research is key to meeting our common challenges

For the natural gas industry to take advantage of these opportunities and achieve its potential for contributing to global economic development and improving our environment worldwide, research that leads to innovation and technology development will continue to be key. Sound science and technical insight can provide essential data for good decision-making and enlightened policy development and lead to new technologies that can reduce operating costs and provide greater efficiencies and enhanced services – to provide real added value for gas customers.



GTI is active in industry efforts to unlock the potential of unconventional gas. (Map excerpted from *World Shale Gas Resource Assessment*, published by the US DOE Energy Information Administration [EIA] in April 2011.)

The industry as a whole is working to develop and refine innovative solutions that will:

- Unlock the potential of unconventional gas for enhanced energy security;
- Improve delivery and infrastructure by assessing ageing assets to determine best practices and tools for rehabilitation and management of the delivery system, implementing new construction, and developing advanced communications;
- Optimise gas utilisation – through more energy-efficient vehicle options and clean power generation;
- Create an integrated smart grid plan for using natural gas in concert with other energy sources;
- Provide an increasing array of energy efficiency and renewable energy options; and
- Develop gasification processes for converting solid feedstock to fuel, power, and chemicals.

It will take significant collaboration among the global gas industry to effectively meet these challenges. Today, it is a two-way street. Some solutions from the US are already being adapted to other global markets, while, in other cases, the US is refining innovative technologies from other countries and applying them domestically. Natural gas vehicles (NGVs), for example, hold a greater market share in countries outside the US. As they continue to experience a resurgence in the US, there is much that can be learned from best practices in other countries.

GTI: sharing our innovations with the world

GTI, the largest non-profit energy research and development organisation in the US, is central to many of these technologies and innovations. Because many disparate and widely dispersed gas industry and research organisations are concerned with these and other issues, we're working to grow our network of international connections to help bring the most effective technological solutions to industry and its customers.

For example, we recognised early on that unconventional gas provides an opportunity for enhanced international energy security. In the US, in particular, unconventional gas has been a game changer, and technology has been critically important in enabling this so-called "revolution".

In the early 1980s, collaborative development of unconventional gas in the US was launched with the help of research programmes led by Gas Research Institute (GRI), a predecessor organisation to GTI. The programmes were enabled by funding from the natural gas industry and the US government, with support and oversight provided by the US Department of Energy.

Today, we are addressing concerns about producing unconventional gas resources in an environmentally and economically sustainable way. Through field-based research projects in US shale plays, GTI researchers are working to advance unconventional gas technology and best practices and to explore options for managing the economic and environmental challenges of hydraulic fracturing and wastewater disposal.

GTI recently signed a Memorandum of Understanding with GFZ German Research Centre for Geosciences to launch the Sustainable Operating Practices Initiative for European Unconventional Gas. The collaboration will address the environmental impact of unconventional gas exploration and production (E&P) activities in Europe.

Spreading our knowledge and expertise

With strong growth projected for the global gas industry, workforce development is an emerging critical issue. Effective training programmes are a key element of sustained global energy development. GTI programmes in gas industry training have been offered since 1941. We've trained over 55,000 gas industry professionals on a broad array of topic areas, including gas distribution and transmission engineering and operations; gas utilisation and marketing; and gas supply, both LNG and unconventional gas – and we're seeing steady international growth.

GTI offers a broad range of training programmes.

GTI has been involved in gasification R&D for more than 60 years.

We have a long and robust history with LNG, having been involved in LNG research, information and training since the 1960s offering courses that cover economics, industry structure and technology. We held the world's first LNG course and first LNG conference in Chicago in 1968. We're part of the organising committee for LNG17 to be hosted in Houston, Texas, USA in 2013.

GTI has also been involved in gasification research and development for more than 60 years and, during that time, has brought scores of energy-related technologies to the marketplace, while managing field installations around the globe. GTI's U-GAS® coal gasification process has been licensed to Synthesis Energy Systems, Inc. (SES), and the two organisations are now working on the design of U-GAS plants in China and the US.

Our organisation has also partnered with Carbona Inc., its part owner Andritz (an international technology company), and Finnish global forestry company UPM-Kymmene to develop biomass gasification technology and support for a commercial-scale biodiesel fuel production facility.

Global collaboration

At GTI, our goal is to contribute our expertise and experience in research, technology transfer, and education and training in global efforts to address today's important energy challenges. As an IGU affiliated organisation, GTI has had long-standing involvements with committees supporting the triennial LNG conferences and IGU Research Conference (IGRC).

Over the past several years, we have increased our activities with global gas organisations, and established a collaborative agreement with the European Gas Research Group (GERG). We have European representation on our Board of Directors, with Marc Florette, Senior Vice President of Research and Innovation at GDF SUEZ.

In September, GTI hosted a global unconventional gas conference in Beijing, China, to transfer

CZECH GAS ASSOCIATION
ČESKÝ PLYNÁRENSKÝ SVAZ

Technical and managerial support for the Czech gas industry

- The CGA represents the Czech Republic in IGU bodies: WOC, PGC and TF, and cooperates with other European and global non-governmental organisations
- Transmits information from international organisations to the Czech gas industry
- Develops legal and technical regulations and helps to harmonise them with EU legislation
- Pursues activities promoting the image of natural gas
- Supports education: conferences, workshops, etc.

Please pencil in your diary:
The Autumn Gas Conference 2011
Prague, Czech Republic, 8 November 2011
For more information please visit: www.cgoa.cz/en/industry-events/AGC-2011.ep

Czech Gas Association
Novodvorská 803/82, 142 00 Praha 4, Czech Republic
Tel./fax: +420 222 518 811, cpsvaz@cgoa.cz, www.cgoa.cz

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>> Solid Decisions

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Gas Technology Institute **www.gastechnology.org**

knowledge and best practices essential to viable development of unconventional gas in regions of emerging resource development. The conference builds on the success of the first annual global unconventional gas conference held last year in Amsterdam.

GTI is also working in coordination with other global organisations, partnering to develop gasification in Asia and Europe. The second international biomass science conference (tcbiomass 2011) was hosted by GTI in Chicago in September, drawing delegates from around the world to share their expertise in biomass gasification.

Looking to the future

Around the globe, nations are committed to a future featuring greater levels of energy security, environmental progress and economic prosperity. Together, we can partner toward achieving those goals and raise standards of living globally. Collaborative R&D is our focus at GTI, and we believe the effort can enable a truly sustainable energy future.

Rod Rinholm is GTI's Executive Director, Education & Business Development. To find out more, please visit www.gastechnology.org or contact Rod at +1 847 768 0868, rod.rinholm@gastechnology.org.

IPLOCA published the second edition of *Onshore Pipelines: The Road to Success* in September.

Karl Trauner.

● Membership of IPLOCA

By Karl Trauner

The International Pipeline & Offshore Contractors Association (IPLOCA) now counts 252 of the world's largest and most influential pipeline construction companies among its membership. The Association continues to grow, with applications for membership coming from both contractors and suppliers to the industry.

The mission of the Association is to provide value to members through a forum for sharing ideas, engaging the industry and its stakeholders, facilitating business opportunities and promoting the highest standards in the pipeline industry.

Within the scope of this mission, one of the Association's specific objectives focuses on developing the science and practice of constructing onshore and offshore pipelines, and associated works, while promoting safety and developing methods for the elimination of accidents, promoting the protection of the environment and contributing to social, cultural and environmental development.

Member collaboration

For the benefit of the pipeline industry at large, a multidisciplinary group of committed representatives of clients, contractors, manufacturers and suppliers provided their time and expertise to focus on key

technical areas of pipeline construction, and to gather this information together into one comprehensive document. Working groups were established to focus on the various stages of a pipeline project: planning and design, monitoring and control, pipeline earthworks, external corrosion protection system, pipe facing, lining up and welding, and lowering and laying.

The resulting book *Onshore Pipelines: The Road to Success* was published in its first edition in 2009. A second edition has just been published, with some additional sections being targeted for inclusion and/or expansion, including further detail on pipeline protection systems, non-destructive testing, trenching and skidless methodology. The aim from now on is to maintain a live version of the document for IPLOCA members to share and develop further via a collaborative wiki.

Environmental statistics return

For many years IPLOCA has required its Regular Members to submit health and safety statistics so that aggregate statistics can be made available. Now the Association is adding environmental statistics to its annual returns, with information being collected from the membership on the number of pipeline project sites, environmental audits, certified management systems, training, and other environmental initiatives. While individual company statistics are confidential, the aggregate information is expected to be beneficial to all.

Human capital

Recognising also that attracting and retaining talented people is a key issue for the industry and that companies have an ongoing need for operator and safety training, the Association is reviewing various training modules with a view to offering them online to members. It is likely that the final modules will be translated into several languages.

In 2016, the Association will celebrate its 50th anniversary of serving the pipeline industry.

For more information about IPLOCA, visit www.iploca.com or contact the Executive Secretary: juan.arzuaga@iploca.com.

Karl Trauner was 2010-2011 President of IPLOCA and is CEO of the Habau Group.

● Oil Supply Issues Present Opportunities for Gas Industry in Transport

By Brett Jarman

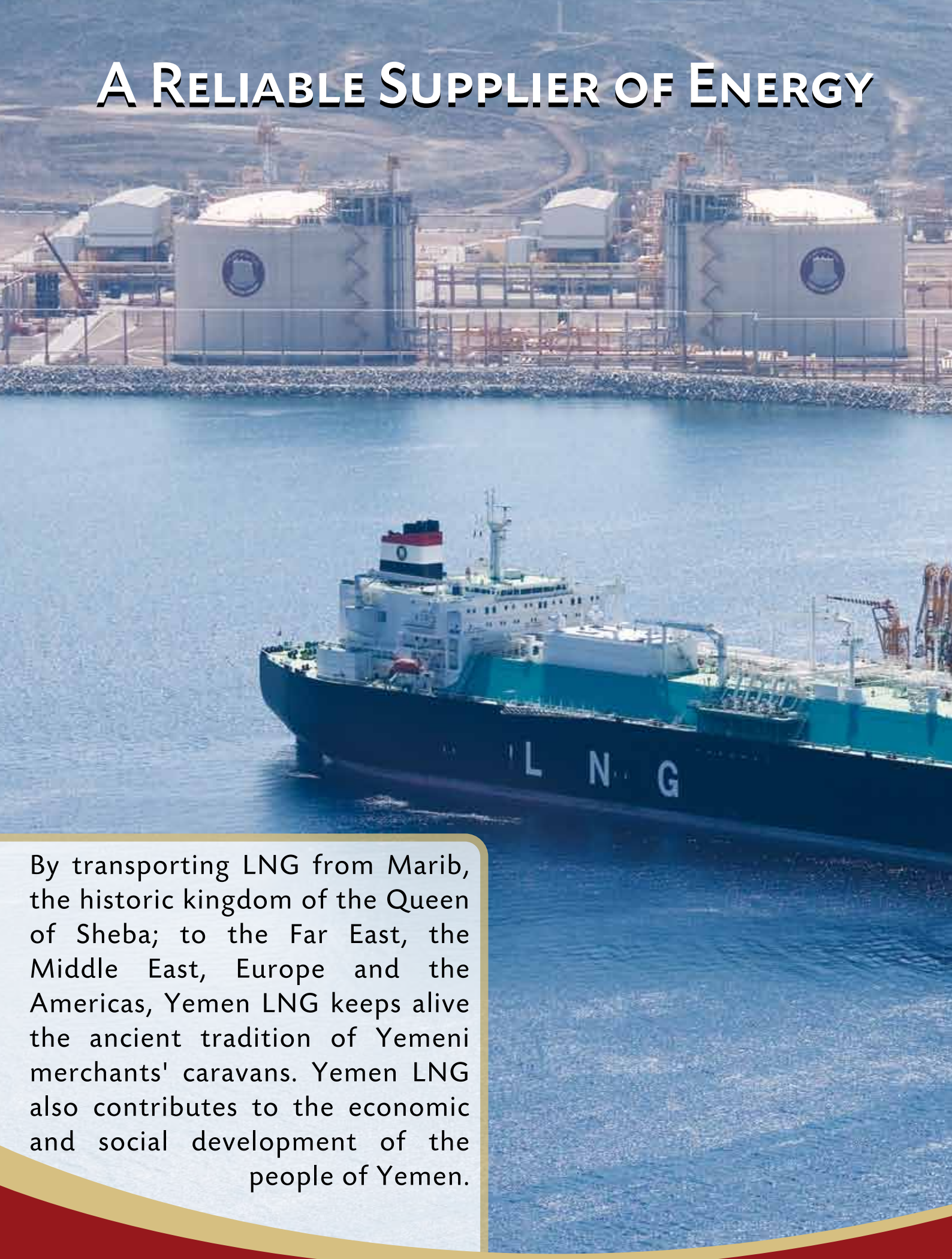
One of the issues that NGV Global as an association strives to get across is the size and scope of the natural gas vehicle (NGV) opportunity. It is often perceived as a niche fuel yet given the right conditions it has the potential to compete on a scale that matches petrol and gasoline. Recent events in the oil markets suggest that not only is this a good idea, it might almost be necessary.

The uncertainty surrounding oil markets is well known in the gas industry and while the industry has clearly embraced opportunities in the power generation arena, the NGV opportunity is still relatively untouched. That's a mistake that could be costing the gas industry dearly.

An intervention in June from the International Energy Agency (IEA) called for the release of 60 million barrels of oil from emergency reserves of its member nations. The intervention is only the third in the IEA's 35-year history and is intended to ameliorate oil supply after disruption caused by events in Libya. While some analysts questioned the need for the stock release at that time, the release reminds us that oil supplies, the lifeblood of most economies, are a fragile balancing act. Most readers will be familiar with the recent report issued by IEA (see http://bit.ly/mn7mqN) suggesting that we are entering a "golden age" of natural gas. From an overall fuel supply perspective it highlights what IEA refers to as "oil's twilight" (see http://bit.ly/l2MTYO) and the need for new mainstream alternatives.

Libya accounted for only 2% of the world's oil production in 2010. Of the remaining 12 OPEC

A Reliable Supplier of Energy



By transporting LNG from Marib, the historic kingdom of the Queen of Sheba; to the Far East, the Middle East, Europe and the Americas, Yemen LNG keeps alive the ancient tradition of Yemeni merchants' caravans. Yemen LNG also contributes to the economic and social development of the people of Yemen.

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Disruption to oil supplies from Libya has triggered a dip into emergency reserves.

nations, five have been subject to large-scale unrest over the past six months. Given Iran's long-term social unrest it would be reasonable to add Iran to this list of politically unstable OPEC countries. These countries were responsible for more than 27% of the world's oil production in 2010.

It's a stark reality that the world's economy is in such unstable hands. If disruption to only 2% of the world's supply can trigger a dip into emergency reserves, what would be the impact of another 2% disruption? Or even 4, 6 or 8%, let alone 27%. The 27% all at once is an unlikely prospect but the smaller numbers are quite feasible, and would have a dramatic impact on world economies.

The IEA move is as much a pre-emptive measure as it is a reaction to the current situation. Announcing the release in June, IEA Executive Director Nobuo Tanaka said that the normal seasonal increase in refiner demand expected for this summer will further compound the shortfall and that greater tightness in the oil market threatens to undermine the fragile global economic recovery.

As well as the normal seasonal increase, we are also in the US hurricane season. Hurricanes in the Gulf of Mexico were the trigger for the last emergency stock release in 2005.

With the political unrest in the Middle East, seasonal increases in demand and the possibility of weather disrupting supplies from the Gulf of Mexico sometime in the second half of 2011, this could be the making of another perfect storm for the oil economy. Though some would argue we are well prepared – IEA member countries' emergency reserves are well stocked with 146 days of net imports stashed away versus the 90 days mandated under the IEA agreement – it could also be argued that it's time for IEA member nations to seriously consider breaking the stranglehold oil has on economies around the world.

The IEA and the emergency reserve programmes were established at a time when there were few viable large-scale alternatives available. That's no longer the case though. Alternative fuels, natural gas in particular, are in a position now to provide a significant proportion of the world's transport energy demand. The problem is that governments continue to think small with their alternative fuel programmes. The last 10 years in particular have seen extensive trials of all sorts of fuel and technologies in the quest for the perfect solution. Billions of dollars have been spent exploring options, some of which will never be viable, some of which are marginal but worthy of continued exploration, and some of which are well proven from a technology point of view. We have enough information now for governments to pick favourites and make serious choices and serious commitments to large-scale alternative fuel programmes.

Stand-out performer is natural gas

NGV technology has proven itself in literally every surface-based transport environment – only air travel remains the last frontier. Importantly it is available on a scale no other fuel can match, both as a low-carbon fossil fuel and a very low-carbon bio fuel (as biomethane).

As well as ticking most environmental boxes, natural gas is a stand-out performer where it's currently needed most – oil displacement. Data from the US Clean Cities Annual Metrics Report (2008) indicates that CNG and LNG both outperform their nearest technology/fuel competitor when it comes to oil displacement by a factor of more than 6:1. This is because natural gas is capable of doing the heavy lifting, moving the largest of trucks and buses from A to B while most other alternatives struggle to move anything larger than a pick-up truck. Excluded from this data are ships and rail locomotives, both of which consume massive amounts of fuel and can be operated on natural gas.

Natural gas can thus address the oil displacement dilemma on a scale and to a capacity that no other fuel can match. It's not just theory, it's proven.

Governments though still hesitate to commit to NGVs on a large scale, often citing cost as a major impediment. Yet the cost of an NGV programme is small compared to the cost of propping up the oil economy with emergency reserves.

The US Strategic Petroleum Reserve (SPR), for example, has been created at a cost of more than $22 billion and currently has a market value of more than $85 billion. There is a legal commitment to increase the reserve by one third in the coming years, which would come at a cost of at least $15 billion. Compare that to the estimated cost of only $5 billion for the proposed NAT GAS Act, which would see imports of OPEC oil into the US reduced by 50% within five years and provide enough momentum to wipe out the other half within another seven years. The NAT GAS Act has the potential to eliminate the need for a strategic reserve in the US yet it languishes in the corridors of Congress while the SPR continues to grow and continues to prop up the oil industry.

The US is not alone though. Of all the IEA's 28 member nations (and all 34 OECD nations), Italy, with 730,000 NGVs, is the only one that ranks in the NGV population top 10. All of the other

NGV technology has proven itself in every surface-based transport environment – Waste Management in Carson, California recently took delivery of its 1,000th NGV truck.

nations, which combine to represent more than 80% of the global NGV count of more than 12 million vehicles, are often referred to as developing nations. In respect to fuel strategy though, we'd have to consider them far more developed than others.

IEA/OECD nations have become the most dependent on crude oil and in the process have become the most at risk as oil's twilight continues to descend upon us. The options for dealing with this are simple – carry on as we are and wait for the real crunch to come in the form of a long-term threat to oil supply or put measures in place so that oil represents a much smaller portion of the transport energy equation.

The gas industry is in a position to influence these options dramatically, both through advocacy work in the political arena and in the marketplace as active players.

In the IEA *Golden Age of Natural Gas* report mentioned above, their World Energy Outlook team considered a range of NGV scenarios for the first time. One of those scenarios suggests a total NGV population by 2035 of 186 million vehicles. Under this scenario, more than 5.7 million barrels of oil, over 12% of demand, would be displaced each year.

Unfortunately, this is considered a high-impact low-probability (HILP) scenario, with about 10% of vehicle sales in 2035 being NGVs. Their base case scenario, suggests only 30 million NGVs on the road by that time, thus displacing less than 1 million barrels per day and less than 2% of demand.

Just how sensitive world oil markets will be in 25 years is anyone's guess but if a 2% drop in supply triggers emergency supplies now, what would it take in 2035? Will there even be any emergency supplies to call upon or will they all have been used up?

The HILP scenario should perhaps be renamed the highly essential long-term plan (HELP) scenario. It represents an absolute minimum government commitment to ensure the economic and energy security needs of their citizens. There is no reason why this can't be achieved and no excuse why it shouldn't be attempted. The fuel is available, the technology is proven and the need is dire.

Helping us get this message across not only leads to more opportunities for the gas industry, it also has a massive impact on future economic scenarios worldwide.

Brett Jarman is the Executive Director of NGV Global (www.ngvglobal.org, www.iangv.org, www.ngvglobal.com).

NGVRUS Expands Membership

By Eugene Pronin

Companies from Belarus, Moldova and Ukraine have joined NGVRUS as full members, while there are corresponding members from Armenia, Georgia, Kazakhstan and Uzbekistan. Thus NGVRUS has developed from a national to a regional association covering a region with more than 400,000 NGVs and annual CNG consumption of over 1.3 bcm.

NGVRUS held its AGM on June 28 and elected a seven-member board of directors. The Chairman is Oleg Aksyutin, a Gazprom board member and Head of the Department for Transportation, Underground Storage and Use of Gas, while the Deputy Chairman is Victor Stativko. I was elected to the board and also appointed Executive Director. The other directors are Peter Sazonov, Deputy General Manager and Chief Engineer of Gazprom Transgas Yekaterinburg, Alexander Sedych, General Manager of AVTOGAZ, Viacheslav Semenyuga, Director of the VNIIGAZ Use of Gas Centre, and Pavel Tsybulsky, General Manager of VNIIGAZ.

We welcome cooperation with NGV associations around the world.

Eugene Pronin is the Head of Gazprom's NGV Division, the Executive Director of NGVRUS and the Leader of IGU's Study Group 5.3.

Many Viewpoints **One Vision**

Scientific curiosity and technical innovation have been part of the Schlumberger culture for more than 80 years. Today, these characteristics lie at the foundation of our vision of helping customers improve performance and reduce technical risk in oil and gas exploration and production, water resource development, and carbon dioxide storage.

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Countdown to the 25th World Gas Conference

By Zahariah Abdul Rahman

With less than a year to go before the 25th World Gas Conference in Kuala Lumpur (June 4-8, 2012), the National Organising Committee's (NOC) preparations are well underway.

The event venue, the WGC2012 Concept Village is taking shape at the Kuala Lumpur Convention Centre. The three main hotels and surrounding areas are being gradually transformed into a seamless event venue housing exhibitions, conference sessions and social activities in one location. The Preliminary Programme has been published, with 13 out of 14 keynote speakers and two of four luncheon speakers having confirmed their participation (see *Table 1*). To obtain a hard copy of the Preliminary Programme, please contact the WGC 2012 Secretariat or you can also download a pdf copy from www.wgc2012.com.

I am pleased to give an update of some of the ongoing activities.

Early Bird registration – before December 31

Providing the best accommodation and hospitality for 3,500 paying delegates takes a lot of planning and coordination. To encourage early registration, we have a special Early Bird rate of $2,700 for registrations received before December 31. Early Birds will also get a chance to win great prizes such as an iPad2 or iPod Touch from our Early Bird Monthly Prize Draw.

With strong partnerships that the NOC has developed with major hotels around Kuala Lumpur, delegates who book accommodation through our official website will enjoy a free shuttle service from all the hotels to the venue every day.

You can register online at www.wgc2012.com to enjoy these great benefits.

Zahariah (Liza) A. Rahman, Chief Executive Officer of WGC2012 / Head Directorate of the National Organising Committee.

Second exhibitors' meeting

With 91% of the exhibition space already booked, (see *Table 2 [over] for the list of confirmed exhibitors*), we organised the second WGC2012 exhibitors' meeting on September 12. Exhibitors were given a full tour of the exhibition area, briefed on the event preparations and met relevant local vendors.

Sponsorship

Besides exhibiting, global companies have also shown tremendous support for the 25th World Gas Conference. PETRONAS, Malaysia's national oil company is the Host Sponsor and will have a strong presence at the official Opening Ceremony and Welcome Gala Dinner. Shell and Qatargas are Principal Sponsors, ExxonMobil, TOTAL and RasGas are Diamond Sponsors and GDF SUEZ and Chevron are Platinum Sponsors. In the Gold, Silver and Bronze categories are KOGAS, BP and Murphy Oil respectively.

Technical visits, excursions and tours

Technical visits are available at two sites. The PETRONAS Petroleum Industry Complex (PPIC) on the east coast of the Malaysian peninsular will showcase a unique model of integration, from upstream operation down to the petrochemical manufacturing facilities. The other site is the

PETRONAS LNG Complex in Bintulu, Sarawak, east Malaysia, one of the world's largest single location LNG production facilities.

For the first time in the WGC series, we are introducing a golf event, which will be held at one of Malaysia's top courses. Day trips will also be available for delegates and accompanying persons. These include a visit to the historical city of Malacca, interactive cooking classes using famous local foods and trekking in the rainforest. You can also catch world class performances at the Istana Budaya (Palace of Culture) or the Dewan Filharormik PETRONAS (PETRONAS Philharmonic Hall).

After the conference, consider taking one of the post-event tours. The wide selection includes fascinating islands, lush green hills and white sandy beaches.

Youth Programme

For the first time at a World Gas Conference a Youth Programme will run concurrently with the main event. Held at an exclusive venue within the WGC2012 Concept Village, the major events being organised for young people include a Plenary Youth Roundtable Forum, Youth Carnival and Conference, Movie Magic Youth Night Out

BELOW
Table 1.

25TH WORLD GAS CONFERENCE TECHNICAL PROGRAMME OVERVIEW (AS AT JULY 2011)

Date	Monday 4 June	Tuesday 5 June	Wednesday 6 June	Thursday 7 June	Friday 8 June
Theme/Time		FOUNDATION FOR GROWTH	SECURING GAS SUPPLY	ENHANCING GAS DEMAND	A SUSTAINABLE FUTURE
08.30 – 09.15		*Keynote Address 1:* **Peter Voser,** CEO, **Royal Dutch Shell**	*Keynote Address 5:* **George Kirkland,** Vice Chairman & Executive Vice President, Global Upstream & Gas, **Chevron Corporation**	*Keynote Address 9:* **Mitsunori Torihara,** Chairman, **The Japan Gas Association**	*Keynote Address 13:* **Christophe de Margerie,** Chairman & CEO, **TOTAL**
		Keynote Address 2: **Rex W. Tillerson,** Chairman & CEO, **ExxonMobil Corporation**	*Keynote Address 6:* **Hamad Rashid Al Mohannadi,** Managing Director, **RasGas Company Limited**	*Keynote Address 10:* **B. C. Tripathi,** Chairman & Managing Director, **GAIL (India) Limited**	*Keynote Address 14:* **Gérard Mestrallet,** CEO, **GDF SUEZ**
09.45 – 11.45		Committee Sessions/ Expert Fora	Committee Sessions/ Expert Fora	Committee Sessions/ Expert Fora	*Strategic Panel Sessions:* **SP9:** Gas & Renewables Partnership **SP10:** Special Panel from the World Petroleum Council (WPC)
12.00 – 13.30		*Luncheon Address:* **Nobuo Tanaka,** Executive Director, **International Energy Agency**	*Luncheon Address:* **Günther Oettinger,** European Commissioner for Energy, **European Commission** (invited)	*Luncheon Address:* **Professor Dieter Helm** Professor of Energy Policy **University of Oxford** (invited)	*Luncheon Address:* **Dr Daniel Yergin,** Chairman, **IHS Cambridge Energy Research Associates (IHS CERA)**
13.45 – 14.30		*Keynote Address 3:* **Alexey Miller,** Deputy Chairman of the Board of Directors & Chairman of the Management Committee, **OAO Gazprom**	*Keynote Address 7:* **Karen Agustiawan,** President Director & CEO, **PT Pertamina (PERSERO)**	*Keynote Address 11:* **Jiang Jiemin,** CEO, **CNPC** (invited)	
		Keynote Address 4: **Paul van Gelder,** Chairman of the Executive Board & CEO, **Gasunie**	*Keynote Address 8:* **Helge Lund,** President & CEO, **Statoil ASA**	*Keynote Address 12:* **Lawrence Borgard,** Chairman, **American Gas Association** and President & COO, Utilities, **Integrys Energy Group**	
14.30 – 16.00	Opening Ceremony	*Strategic Panel Sessions:* **SP1:** The Future of Natural Gas: Winning the Race for Talent **SP2:** Youth Roundtable Forum	*Strategic Panel Sessions:* **SP3:** Impact of Geopolitics on Natural Gas Market Development **SP4:** Unconventional Gas: A Game Changer or a Global Bubble? **SP5:** The Future of LNG	*Strategic Panel Sessions:* **SP6:** The Case for Natural Gas **SP7:** Contribution of NGVs in Sustainable Transport & Opportunities for the Gas Industry **SP8:** Innovation & New Technology: The Key to Increase the Gas Business	*Special Session:* Triennial Work Programme 2012-2015
16.30 – 18.30	Exhibition Opening & Networking	Committee Sessions/Expert Fora	Committee Sessions/Expert Fora	Committee Sessions/Expert Fora	Closing Ceremony
19.00 – 21.30					Farewell Party
20.00 - 22.30	Welcome Gala Dinner				

Plenary Sessions | Breakout Sessions | Luncheon Addresses | Official Ceremonies | Social Events

EXHIBITORS' LIST (AS AT JULY 2011)

Airmotec AG/Chromatotec	GasTerra/Gasunie	Mesura SA	Romet International Limited
AIUT sp. z o.o.	Gazprom Expo	MISC BERHAD	ROMGAZ
Asturi Metal Builders (M) Sdn Bhd	GCE Group	MSET Engineering Corporation Sdn Bhd	Royal Dutch Shell Ltd
BASF S.E.	GDF SUEZ	National Iranian Gas Company (NIGC)	Royal Norwegian Embassy, Commercial Section
BG Group	GE – Dresser	Nexant Ltd	RWE Supply & Trading GmbH
BP Gas Marketing Ltd	GeoFields	NMi	Sapura Crest Petroleum Bhd
Brunei LNG Sendirian Berhad	Germanischer Lloyd GLM Sdn Bhd	NOVATEK	SBM Offshore
Canusa-CPS	Heatec Jietong	OMV Gas & Power GmbH	Schütz GmbH Messtechnik
Cheniere Energy Inc	Heatec Jietong Pte Ltd	Pergam-Suisse AG	Siemens AG
Chevron Gas and Midstream	Heath Consultants Incorporated	Perisai Petroleum Teknologi Berhad	Solar Alert Sdn Bhd
China National Petroleum Corporation	Hermann Sewerin GmbH	Petrobras	Solar Turbines Incorporated
CPL Concordia Soc. Coop	Honeywell Pte Ltd	Petroliam Nasional Berhad (Petronas)	Sonatrach
Delcom Services Sdn Bhd	ICIS Heren	PETRONAS Management Training Sdn Bhd	Statoil
Dialog Group Berhad	IHS Global Ltd	Petrovietnam Gas Corporation	Syddal Engineering
E.ON Ruhrgas AG	Iran Liquified Natural Gas	Pietro Fiorentini SpA	Talisman Malaysia Limited
EDF	ISA Test Chris	Platts	TAQA Arabia
Elgas s.r.o	Itron	Polish Oil & Gas Company (PGNIG)	Technip Malaysia
Elster – Instromet GmbH	Kencana Petroleum Berhad	Polytec Co, Ltd	The Japan Gas Association
Emerson Process Mgt Regulator Technologies	KNM International Sdn Bhd	PROMAT ESM Sdn Bhd	Tormene Americana
Endress + Hauser Instruments	Korea Gas Corporation	PSI AG	TOTAL
International AG	Krohne Oil & Gas	PT PERTAMINA (PERSERO)	Vitol S.A.
ExxonMobil Corporation	Kuala Lumpur Valve & Fitting (M) Sdn Bhd	PT Perusahaan Gas Negara (Persero) Tbk	WGC 2015 (CMG 2015)
Fluxys SA	Lima Bintang Shipping & Forwarding Sdn Bhd	PTT Public Company Limited	Wintershall Holding GmbH
Gas Natural Fenosa	Maser Gas Berhad	Qatar Petroleum	Wood Mackenzie Asia Pacific Ltd
Gascat Industria E Comercio Ltda		Radius Systems Ltd	Yemen LNG Company Ltd

ABOVE
Table 2.

and Fun with Gas Carnival. For full details see the article on pages 212-214.

See you in Kuala Lumpur

Malaysia's attractions include its diverse multi-cultural population, adaptable lifestyle and well-developed infrastructure. This conference is a great chance to experience the unique Malaysian hospitality and cultural delights.

Along with the new elements, WGC2012 will uphold the long tradition of IGU advocating gas as the fuel of choice for sustainable progress, with a programme of highly informative and engaging content.

I look forward to seeing you in Kuala Lumpur!

Zahariah (Liza) A. Rahman, Chief Executive Officer of WGC2012 / Head Directorate of the National Organising Committee.

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Many parts working together—
the only way to solve the world's energy challenges.

By 2030 we expect energy demand to be about 35 percent higher than it was in the year 2005, driven largely by people in the developing world seeking higher standards of living. Meeting this growing long-term demand requires that we develop all economic sources of energy—oil, natural gas, coal, nuclear and alternatives.

This global energy demand challenge is matched by a global environmental challenge—curbing greenhouse gas emissions and addressing the risks of climate change. No single energy technology available today solves this dual challenge, and it is very likely no single energy technology will solve it tomorrow.

We need an integrated set of solutions, powered by technology and innovation—ranging from producing energy more effectively...to using it more efficiently... to improving existing alternative sources of energy...to developing new options.

ExxonMobil is working to help meet the world's energy challenges—investing billions in additional supplies, developing technology options to improve vehicle efficiency, and testing new carbon capture technologies that could reduce emissions significantly. Because only by integrating all of our energy options—new sources and new technologies—will we solve our dual energy and environmental challenges.

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COORDINATION COMMITTEE PROGRESS REPORT

So you want to be an engineer?

Energy is the lifeblood of modern civilisation. Laptops and smart phones have changed the way we communicate, but only because there is sufficient and affordable electricity to charge their batteries.

At the same time, we need to mitigate the threat of climate change by reducing greenhouse gas emissions. An affordable, environmentally acceptable and technically straightforward option to power and sustain people's lives is to increase the world's reliance on natural gas, the cleanest-burning fossil fuel.

As technology advances, so does our ability to unlock the world's gas resources. According to the IEA, technically available gas resources equal 250 years of current production. Growing gas supplies, in combination with new pipelines and a globalising LNG market increase flexibility, supply security and long-term price stability.

The gas industry, like many other technically complex industries is faced with a challenge. Will there be sufficient engineering talent to execute much needed future gas projects? For this reason Task Force 2 – Nurturing the Future Generations – is one of the most important task forces of World Gas Conference 2012. Young people are needed in the oil and gas industry to realise future projects.

So how can we connect the world of oil and gas to the world of young people? Studies seem to indicate that all young people regardless of gender, race or geographic location are interested in learning about things that are being explored, things that are unknown or new. There is a reason why programmes like *How do they do it?* and *MegaStructures* are so popular!

The oil and gas industry has many projects that deserve to be presented on popular science programs we now watch on our TVs. It is up to us to show the beauty of the incredible ideas and unconventional technologies that lie behind some of the world's largest oil and gas projects.

Shell's floating liquefaction technology definitely has the ability to attract people who previously may not have considered a career in the oil and gas industry. Imagine a facility longer than four football fields end-to-end, and using five times as much steel as the Sydney Harbour Bridge. These are the dimensions of the Floating Liquefied Natural Gas (FLNG) facility, which will be located off the coast of North West Australia. The scale of the project is immense. When built, the facility will be the largest floating offshore facility in the world, weighing around 600,000 tonnes and using some 260,000 tonnes of steel. The on-board equipment, powered by a gas-fired plant, will clean and liquefy the gas, shrinking its volume by more than 600 times. Once operational, crew members together with Shell colleagues in shipping, commercial roles and support functions will work around the clock to produce, liquefy and bring the natural gas to markets around the world.

At Shell, we look forward to working on future FLNG projects beyond this first Australian flagship project, and thereby not only bringing new natural gas sources successfully to market, but also attracting talented new colleagues to this exciting industry.

PRELUDE FLNG: MEETING THE ENERGY CHALLENGE.

AT SHELL WE WORK WITH GROUND BREAKING TECHNOLOGY AND THE INDUSTRY'S MOST TALENTED INDIVIDUALS TO PLAY OUR PART IN SECURING A RESPONSIBLE ENERGY FUTURE.

We have a significant track record driving forward innovative energy projects and this includes the pioneering Prelude Floating LNG Project. To be located over 200km off northwest Australia, Prelude FLNG will use ground breaking Floating LNG technology to process gas on site, rather than piping it to an onshore plant. This unique approach will provide access to remote natural gas reserves, allowing us to help meet the world's future energy demands. The Prelude FLNG facility is only one of many innovative major projects we are developing at Shell.

If you'd like to play a part in helping to power people's lives around the world for generations to come and, can apply a creative mind to some of the world's biggest energy challenges, you can find out more at **www.shell.com**

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Introduction and Key Developments

By Ho Sook Wah and Ungku Ainon Ungku Tahir

Ho Sook Wah, CC Chairman (LEFT) and Ungku Ainon Ungku Tahir, CC Secretary (RIGHT).

This third progress report of the 2009-2012 Triennium aims to provide the reader with information about the status of the work as described in the Triennial Work Programme (TWP). It consists of contributions and updates by IGU's five Working Committees (WOC), five Programme Committees (PGC) and three Task Forces (TF) while entering the last year of the Malaysian Presidency. Some IGU activities initiated by the Coordination Committee (CC) during this Triennium are also highlighted.

● WGC2012 Call for Papers

The Call for Papers for the 25th World Gas Conference, which was launched online on February 1, was also published and sent out to more than 10,000 IGU contacts in mid-February. Abstracts had to be submitted through the online e-Abstract Management System by September 1. A procedure for selecting papers was discussed and agreed at the last CC meeting in Rio de Janeiro. All authors will be notified about the status of their papers by November 15. The full papers have to be submitted by the successful authors by February 1, 2012. Further information can be found on the WGC2012 website www.wgc2012.com.

● CC meeting

The Coordination Committee held its sixth meeting on April 5 in Rio de Janeiro, Brazil. The Chairs and/or representatives of the various Committees and Task Forces presented the progress and challenges of their work in the presence of IGU Executive Committee (EXC) members and guests during the open second session of the meeting. Earlier in the closed first part of the meeting, a productive discussion on several key issues relating

Rio de Janeiro was the venue for the sixth CC meeting of the Triennium.

to the 25th World Gas Conference had ensued. Discussions were focused on the review procedures for the Call for Papers and the programme content and activities planned for WGC2012, including the Youth Programme. The Call for Papers booklets were also made available throughout the CC/EXC meeting.

The Technical Programme Committee of the IGU Research Conference, represented by Marc Florette, gave a presentation on the forthcoming IGRC2011 in Seoul. Marc also briefed delegates on IGU's continuing initiative on "Best Practice Ideas and Proposals", a useful compilation of best practices that cuts across the gas value chain for which submissions from all Technical Committees were invited through the Call for Papers process.

The CC meeting was followed by a meeting of the EXC, which included a one-day workshop on gas advocacy in which CC members participated. Workshop participants were divided into four regions, each of which was led by their Regional Coordinator (or designated representative). The group members shared experiences of their countries' gas industries and brainstormed on the appropriate strategies to advocate for gas in their region.

The CC Chairman, Secretary and representatives from IGU Management continue to attend and participate in the scheduled Committee meetings whenever possible, or through conference calls with the Committee leaderships to discuss the work progress and related matters.

The minutes of the meeting in Rio de Janeiro and the respective presentations are published on the CC section in the IGU website, accessible to members.

Workshop and roundtables

A TF 2 workshop and TF 3's second roundtable were held in the first half of the year.

The TF 2 workshop was held on March 17 in Paris to review strategic recommendations and the main findings of the assessment of key trends and developments in 10 countries in STEM (science, technology, engineering and mathematics) education, as part of the TF 2 project on "Nurturing the Future Generations".

A working session during the EXC meeting in Rio.

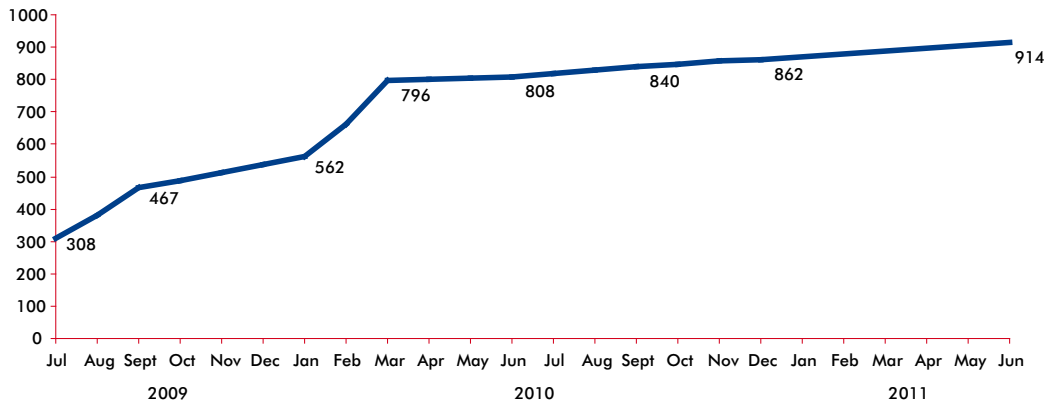
TF 3's roundtable, looking at the Middle East and North Africa (MENA) region, was held on April 19 in Muscat, Sultanate of Oman. The focus was on developing a deeper understanding of regional geopolitical issues in the MENA region.

Highlights of these two events are included in the progress reports from the Task Forces on pages 120-132

TF 3's third roundtable, "South America Roundtable on Geopolitics and Natural Gas" was held on August 22 in Rio de Janeiro, while the

Datuk Rahim addresses delegates during the evening reception.

EVOLUTION OF COMMITTEE MEMBERSHIP (AS OF JUNE 2011)



RIGHT
Figure 1.

fourth, "Europe-Russia Roundtable on Geopolitics and Natural Gas" is scheduled for September 30 in Amsterdam. Highlights of these events will be included in the next progress report.

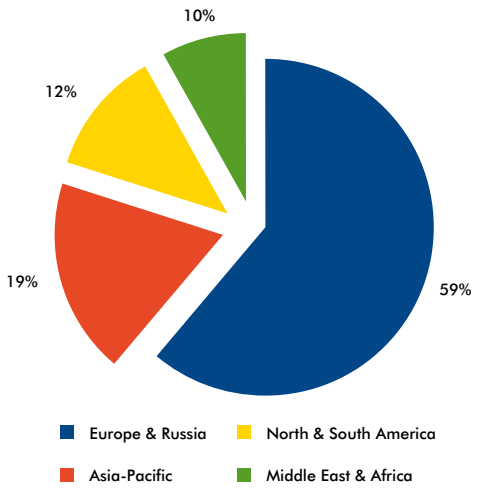
● Technical Committees and Task Forces: Membership

We are pleased to note the increasing interest in the work of the Committees from IGU members. Membership in the Technical Committees has grown to 914 professionals from more than 50 countries, a new record for IGU. *Figure 1* shows the evolution of membership from the start of the Triennium. *Figure 2* depicts a good global coverage in terms of participation which has certainly enriched the studies and activities of the Technical Committees and Task Forces. The breakdown of members by Committee and Task Force is shown in *Table 1*.

All the Committees and Task Forces held their 2011 spring meetings as scheduled and are progressing very well with their respective studies and work activities. A summary of their progress reports is presented in the following chapter.

RIGHT
Figure 2.

GLOBAL COVERAGE



● New publication on LNG

In June 2012, IGU launched a new publication entitled *World LNG Report 2010*. The report is the work of a special Task Force under PGC D, supervised by the CC, and is a comprehensive report on the state of the LNG industry covering the entire LNG chain: liquefaction, shipping, regasification and trading. A special section on the impact of unconventional gas on the LNG industry is also included in this inaugural edition, which is sponsored by Petronas.

The launch marks an important milestone for IGU as the spokeman for the world's natural gas industry. It is hoped that this report will serve as a

useful reference, both for seasoned professionals as well as those interested in the LNG business

The *World LNG Report 2010* can be downloaded from the IGU website.

WGC2012 in Kuala Lumpur

The preparations for the 25th World Gas Conference in June 2012 are progressing well.

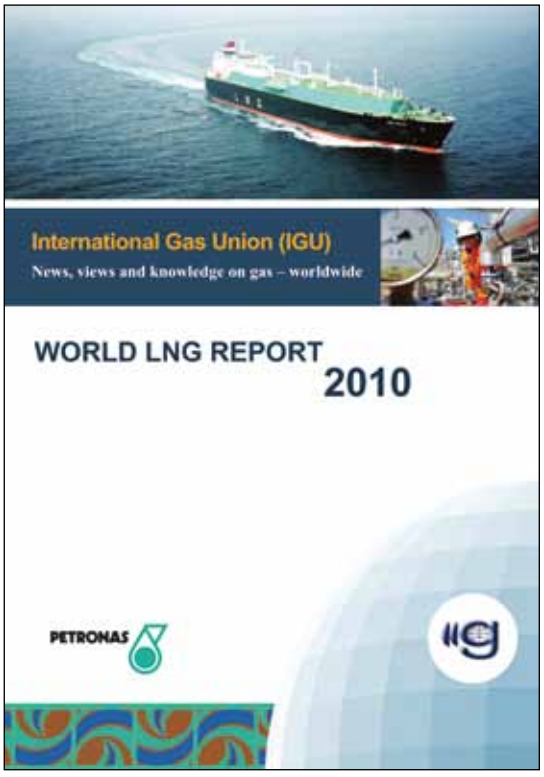
The overall WGC programme has been structured along different themes for each day. Beginning with the theme "Foundation for Growth", the conference progresses with "Securing Gas Supply"' then "Enhancing Gas Demand" and builds up to "A Sustainable Future" on the final day. The keynote speakers and Strategic Panels have been planned and structured in line with the theme of each day and to date, 13 of 14 keynote speakers, comprising captains of the industry and major gas associations have confirmed their participation. The 10 Strategic Panels represent topics of strategic and current significance to the gas industry including key topics such as unconventional gas, gas advocacy, LNG, natural gas for transport, innovation and research, and renewables.

A separate Poster Session has also been planned featuring technical papers by selected authors. Also included for the first time at the 25th World Gas Conference is a Youth Programme which will run concurrently with the main WGC event. The programme which includes a Youth Carnival, Youth Forum, Science Centre Gas Carnival and other youth activities, promises to be an exciting event aimed at nurturing young people to be leaders and to sustain the future growth of the gas industry.

Ho Sook Wah is the Chairman of the Coordination Committee and Ungku Ainon Ungku Tahir is the Committee's Secretary. Readers requiring further information are invited to contact Ungku Ainon at ungkuainon@malaysiangas.com or to visit IGU's website at www.igu.org.

TECHNICAL COMMITTEE MEMBERS (AS OF JUNE 2011)

WOC 1	Exploration and Production	44
WOC 2	Storage	74
WOC 3	Transmission	95
WOC 4	Distribution	81
WOC 5	Utilisation	93
PGC A	Sustainability	62
PGC B	Strategy	132
PGC C	Gas Markets	87
PGC D	LNG	91
PGC E	Marketing	65
TF 1	Building Strategic Human Capital	47
TF 2	Nurturing the Future Generations	27
TF 3	Geopolitics and Natural Gas	16
Total		914



FAR LEFT
Table 1.

LEFT
IGU has launched a new LNG report.

Energy turnaround with natural gas

By Klaus Schäfer, CEO of E.ON Ruhrgas AG

Since the events in Japan, finding the right energy mix has again become the order of the day in many countries of the world. Probably no other government has taken such far-reaching decisions as Germany's, which intends to phase out nuclear energy by 2022. Not least due to its high availability and flexibility, natural gas can expand its key role in an increasingly low-carbon energy world. Natural gas performs two important functions in handling this energy turnaround: It assists the integration of renewable energy sources into supply systems and makes an important contribution towards stabilising power generation.

Klaus Schäfer, CEO of E.ON Ruhrgas AG

Technological innovations have made the North American gas market largely independent of imports. Unconventional gas resources now account for over 50% of total US gas production. In the second half of this decade, the United States could even become an LNG exporter. In the medium to long term, production of significant unconventional gas resources is also possible in other parts of the world. Furthermore, worldwide supply of LNG has increased considerably due to the development of substantial liquefaction capacities. Among LNG producers, Qatar is currently the leader with an annual production capacity of 77 million tonnes, followed by Australia, which might ramp up its annual capacity to over 100 million tonnes by 2020.

Almost all forecasts anticipate a rise in global and European gas consumption in the medium to long term, primarily depending on power generation. Low investment costs, short construction times, high efficiencies, climate compatibility and flexible operation speak in favour of modern gas-fired power stations. However, the environment has to be right for concrete investment decisions: This will be largely determined by the further development of power and gas prices as well as carbon prices. Basically, gas-fired power stations ideally supplement renewables and are well suited to balancing power demand and fluctuating power generation from wind and solar energy.

The European gas industry buys gas from several supply countries and has been linked in partnership with major producers for several decades. Importers invest in their own gas production, the procurement of LNG and international pipeline projects. The Nord Stream twin pipeline through the Baltic, of which the first pipeline has been completed, makes an important contribution to security of supply for Germany and Europe. Further diversification will be achieved by major pipelines to south-eastern Europe, which are currently at the planning stage.

Given the current situation in Europe with a growing importance of trading markets, long-term supply contracts between producers and importers have to be adapted to the new framework. Pricing must ultimately always reflect the reality of sales markets. Gas wholesale prices in Europe are today primarily determined on trading markets, while oil-indexed pricing has become far less important. These developments have to be taken into account in long-term supply contracts.

Natural gas and the well-developed European gas infrastructure offer promising prospects for a smart, efficient energy system of the future. In the long run, natural gas is also a suitable storage medium for surplus renewable power supply. To be more specific: Power produced from renewables is converted into hydrogen or methane and fed into the gas grid. This opens up new opportunities for a future energy system based on the existing, well-developed European gas infrastructure.

Kevin Yule
Manager, Developing Assets
E.ON Ruhrgas

»We are active along the entire gas value chain«

E.ON Ruhrgas is a leading European gas company and responsible for the global gas business in the E.ON Group operating worldwide. We have a growing E&P and LNG business. We operate Europe's largest gas supply business, supplying gas to resellers, large industrial customers, and gas-fired power stations in and outside Germany. Our geographically diverse portfolio of long-term supply contracts with key producing countries makes us a pillar of gas supply security in Europe. We are also engaged in gas storage in Germany, Austria, Hungary, the U.K. and in gas transmission in Germany. Read more at: **www.eon-ruhrgas.com**

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Progress Reports from the Committees

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

Working Committee 1 – Exploration and Production

WOC 1's third meeting of the Malaysian Triennium took place in Rio de Janeiro, Brazil, March 15-16. Twelve delegates from six companies in five countries attended the meeting.

The CC Chairman, Ho Sook Wah updated delegates on the Coordination Committee's work and other IGU activities before focusing on WGC2012. He briefed delegates on the deadlines and guidelines for the Call for Papers, explaining that abstracts had to be submitted through the e-Abstract Management System by September 1 with the full papers due by February 1, 2012. He reminded WOC 1's paper selection committee to choose backup papers in the event that selected speakers cannot participate.

Delegates to WOC 1's third meeting of the Triennium pose for a group photograph at the Pestana Hotel in Rio de Janeiro, where the working sessions were held.

Ho also pointed out that the current Vice Chair of WOC 1 will assume the chairmanship in the forthcoming French Triennium, 2012-2015.

SG 1.1 *Recent advances in exploration and natural gas production*

Leader: Hugo Repsold, WOC 1 Vice Chair (Brazil)

Members of SG 1.2 agreed to divide responsibilities for their work as follows:

- Assessments of resources and reserves – members from Algeria and Russia led by Ilhane Dib (Algeria);
- Trends in exploration and discoveries – members from Germany, China and the UK led by Gregor Hollmann (Germany);
- New frontier and exploration areas – members from France, Indonesia, Iran and Romania led by Vincent Trocmé (France); and
- Recent technologies and gas development standards – members from Brazil, Malaysia, Norway, Portugal, Saudi Arabia and Spain led by Hugo Repsold (Brazil).

The first draft of each sub-topic had to be sent to Hugo Repsold by July 31 and reviewed by him with comments by August 31. At presstime, the deadline for final comments by all WOC 1 members was September 30.

This Study Group will also be responsible for continuing work initiated during the 2006-2009 Triennium to update the assessment of resources and estimates of reserves of conventional and unconventional gas in each IGU region.

A comprehensive analysis will be performed as well as an identification of key statistical indicators for regional exploration efforts (e.g. investments made and wells drilled). To identify new gas resources, an inventory of results in terms of success rates and discovered volumes will be made and the "creaming curves"[1] for the most significant gas provinces will be updated.

1 The creaming curve displays the cumulative discovery versus the cumulative exploration activity.

The aim is to identify medium- and long-term global trends for gas supply.

SG 1.2 *Most significant new E&P gas projects*
Leader: Flavia Di Cino (Argentina)
The focus of SG 1.2's report has been re-oriented by Amine Mazouzi, WOC 1 Chair. Instead of a case-by-case description of a selection of projects, the Study Group will take a more strategic approach. The main trends in global gas developments, both conventional and unconventional, will be identified and carbon capture and storage will be evaluated as a solution to the development of major sour gas projects. Key technological trends will be addressed by SG 1.1 taking advantage of the expertise of Petrobras, particularly offshore.

The new criteria for addressing trends in current gas projects will include timing and portfolio management issues, investments and the level of gas prices needed to develop projects. There will also be a focus on regulatory frameworks for unconventional developments.

● Planning for WGC2012

WOC 1 will have two Committee Sessions and two Expert Fora at WGC2012 in Kuala Lumpur.

Committee Session 1.1 "Natural gas exploration and production" will be jointly chaired by Flavia Di Cino of Tenaris (Argentina) and Gregor Hollmann of E.ON Ruhrgas (Germany).

Committee Session 1.2 "Current and future exploration and production gas developments" will be chaired by Hugo Repsold of Petrobras (Brazil) and Vincent Trocmé of GDF SUEZ (France).

Expert Forum 1.A "Exploration and production challenges: finding the 'Big Elephants' vs. effective development" will be chaired by Nasir Hj Darman of Petronas (Malaysia) and Ilhane Dib of Sonatrach (Algeria).

Expert Forum 1.B "De-risking and de-stranding gas resources" will be chaired by Kamel Eddine Chikhi of Sontrach (Algeria) and Seungho Lee, of Kogas (South Korea).

WOC 1 delegates are entertained during the gala dinner at the Real Astoria restaurant.

Future meetings

At presstime, WOC 1's fourth meeting was due to be held in Paris, France, September 26. The last meeting of the Triennium is scheduled for February 4, 2012 but the venue is yet to be determined.

WOC 1 is also proposing to hold a workshop entitled "Shale Gas Development: Challenges and Achievements – Impact on the Global Gas Industry" in Algeria in early 2012. Full details will be announced in due course.

● Working Committee 2 – Storage

WOC 2's third meeting of the Triennium was hosted by NAFTA and the Slovak Gas and Oil Association in Bratislava, Slovakia, March 15-17. Some 50 members participated in the meeting, including senior Slovakian representatives.

In line with WOC 2's tradition, a workshop was held during the meeting entitled "Best practices in simulations". There was also a technical tour of the Lab complex, the biggest storage facility in Slovakia.

During the workshop, seven presentations were given and they are available online. The topics were:

- "Long-term monitoring, pressure increase and storage optimisation for UGS based on

WOC 2 held its third meeting of the Triennium in Bratislava.

operational experiences in north-east Germany", Dr Jochen Zemke, UGS GmbH;

- "Challenges in mathematical modeling and their solution", Stanislav Bílik (NAFTA a.s.) & Ján Kovár (POZAGAS a.s.);
- "Simulation and practice of UGS in a low-quality gas reservoir", Jerzy Stopa, AGH University of Science and Technology;
- "Practice of use of modelling on Inchukalnsky UGS (Latvia)", Edgars Birgers, Latvijas Gaze;
- "Tuning of integrated surface/subsurface model", Tomáš Ferencz & Vladimír Lorenc (NAFTA a.s.);
- "Risks of UGS geological modelling", Alexander Grigoriev, Vniigaz; and
- "Better water production forecasts for enhanced performances", Patrick Egermann, Storengy.

WOC 2's meeting also provided an opportunity to give updates on IGU and CC activities as well as on the programme for WGC2012. Hélène Giouse, WOC 2 Chair conveyed the updates and also introduced the themes of the WOC 2 Committee Sessions and Expert Forum. The three Committee Sessions will be:

- 2.1: "New UGS projects for new gas markets";
- 2.2: "Optimising UGS capacities: challenges for operators and clients"; and
- 2.3: "Competencies and innovative technologies for efficient UGS".

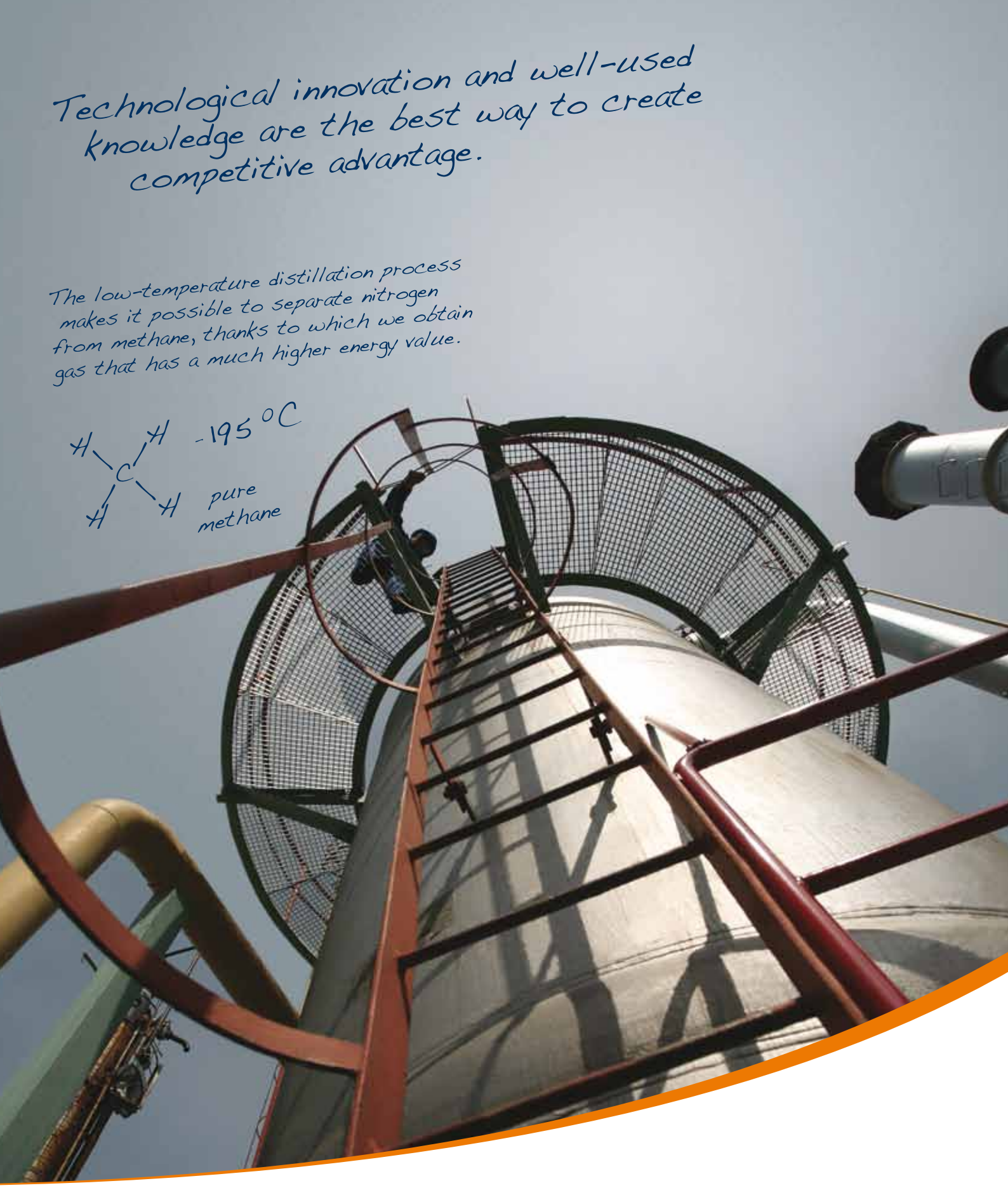
There will be only one Expert Forum for WOC 2 and this will be co-chaired with PGC A: "CO_2 sequestration: technologies involved and project developments to increase the gas industry's sustainability".

Participants were reminded and encouraged to submit papers by the deadline for submission of abstracts of September 1.

Kangwon Lee, a member of the IGRC2011 organising committee, gave an update on this event which will take place in Seoul, October 19-21. Hélène Giouse will chair the session entitled "How can advanced geo-engineering impact bottomline performance?" Everyone was invited to register for IGRC2011.

Progress of the sub-groups

SG 2.1 *Updating and improving the UGS database and promoting it as a reference*
Leader: Ladislav Goryl (Slovakia)
As previously reported, the questionnaire was sent out in August 2010. Many answers have been received and missing data were subsequently collected to reach a satisfactory level. However, responses from some important UGS countries are still awaited (e.g. Ukraine, Italy). WOC 2 Vice Chair and SG 2.1 Leader, Ladislav Goryl has asked his colleagues to reply as soon as possible.



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Energy through knowledge

The next step is to analyse the results to identify the main trends in UGS in terms of the total working volume, the percentage of cushion gas according to the types of storage sites, the types of compressors used, withdrawal and injection rates, etc. At presstime, the final step in the analysis of the results was due to be developed during an intermediary meeting in Copenhagen, Denmark in September.

The content of the report will be organised around three axes:

- An outlook study consistent with the data obtained by PGC B (contacts have already been made with PGC B which will provide all the necessary updates);
- General aspects including commercial ones (such as the competitiveness of UGS with other flexibility tools); and
- New areas of storage utilisation (H_2, carbon capture and storage – CCS, compressed air energy storage – CAES, support of renewables, storage of flared gas etc.).

The first draft should be ready by the end of this year.

SG 2.2 *Definition of some best practices in UGS operation and design*

Eddy Kuperus (The Netherlands) has had to stand down as leader due to new responsibilities in his company. Hélène Giouse chaired the SG 2.2 meeting in Bratislava and will supervise the progress of the Study Group until the end of the Triennium.

Methane emissions (Pierre Marion, France)

A short questionnaire has been sent out and around 10 answers received. Three countries have regulations on the topic. The ranking of emissions sources is clearly:

1. Compressors;
2. Venting a part of the surface installations for servicing; and
3. Well servicing.

The report will note that emissions due to UGS activity are low, look at progress in recent years and investigations carried out, and conclude that while best practices need to be promoted, time is needed for their implementation.

An article looking at efforts to reduce methane emissions in UGS operations has been prepared for this issue of the IGU Magazine issue (see pages 152-153).

Well integrity assessment (Nikita Barsuk, Russia)

The final report will start by analysing the results of the workshop on well integrity management which was held in St Petersburg in June 2010. The key sections of the report will deal with methodologies, measurements and existing regulations.

Report on CO_2 sequestration (correspondent Herman Spreckels, Germany)

The report for the joint Expert Forum with PGC A will present a worldwide panorama of CO_2 sequestration projects using a database developed by VNIIGAZ. A teleconference with PGC A was held on June 16 to discuss cooperation and the organisation of the joint session.

SG 2.3 *Skills and competencies for UGS activities*

Leader: Vladimir Onderka (Czech Republic)

SG 2.3 has been working on two projects: the organisation of the Young Professional Exchange Programme (YEEP) and a questionnaire.

YEEP delivers courses on storage issues to young professionals working in gas companies. The three topics selected are: geosciences, reservoir engineering and gas treatment. The language of instruction is English. YEEP was launched in Moscow on June 20, which coincided with the beginning of the first course supported by Gazprom UGS and Gubkin University.

The two other courses took place in the Czech Republic with the support of the Technical Institute of Liberec and RWE, and the Institute of Chemical Technology and the Czech Gas Association

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respectively. The courses were spread over six weeks until the end of July. A total of 15 candidates from China, Russia, Germany, Poland and Czech Republic were registered.

A questionnaire was sent to HR managers of storage companies in December 2010 and around 15 answers were received. The analysis of these results will be the basis of the Study Group's report.

Next meetings

The next WOC 2 meeting will take place in Essen, Germany, November 14-16. The final meeting of the Triennium will be held in Madrid, Spain in February or March 2012.

● Working Committee 3 – Transmission

WOC 3's third meeting was hosted by Total in Rio de Janeiro, Brazil, February 9-11, a time when the city's inhabitants were busy preparing for the carnival and the samba schools were practising in secret locations. Indeed, music greeted delegates as they arrived in the meeting room with WOC 3's anthem "I can't give you anything but …" played over the speakers and the text displayed on the projection screen so delegates could sing along. The meeting was well attended by 40 members from 24 countries.

WOC 3 Chair, Eric Dam welcomed participants and thanked the CC Chairman, Ho Sook Wah for attending the meeting. He gave a special welcome to WOC 3's new Vice Chair, Benjamin Guzman from TGS Argentina and four other new members. Eric also thanked Total for hosting the meeting and for organising an excellent programme.

Cynthia Silveira, Total's Gas & Power Director in Brazil welcomed participants to Rio de Janeiro. Announcing Brazil's bid for the IGU Presidency 2015-2018, she expressed Brazil's continuous support for and participation in IGU activities. She gave a presentation on Total and the company's activities in Brazil and wished everyone a pleasant stay in Rio de Janeiro.

Four other interesting presentations were given during the plenary by:

- Rastislav Ňukovič on recent developments at Eustream (Slovakia);
- M. V. Iyer on recent developments at GAIL (India);

Delegates to WOC 3's third meeting pose for a group photo in Rio.

the gas highway for europe

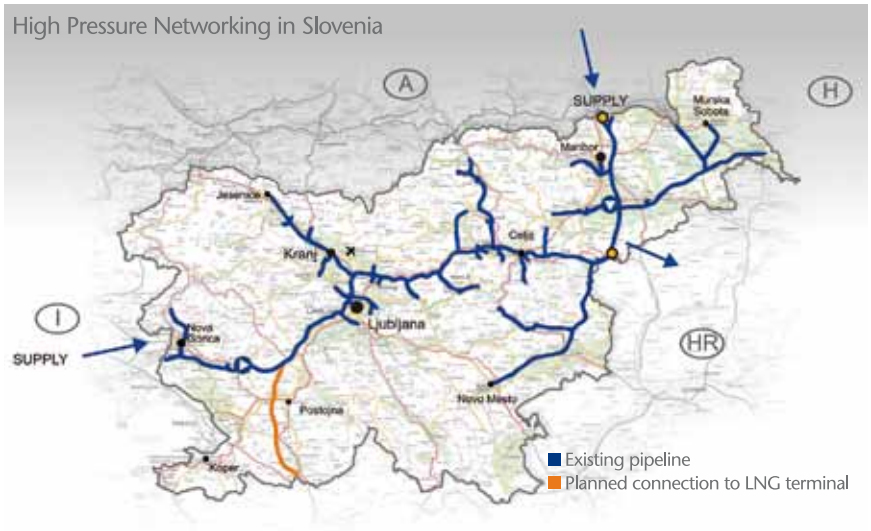
www.eustream.sk

Our basic mission is to transport natural gas in Slovakia and through Slovakia to the European markets. To this end, we operate a large-scale high-pressure gas transmission system in the territory of the Slovak Republic. This transmission system represents an important energy link between the Commonwealth of Independent States (CIS) and the European Union. In other words, we are the main entry gate and the biggest highway for Russian gas in the EU. The business name "eustream" is intended to reflect this specific role we have.

eustream

■ Geoplin, a leading Slovenian gas marketer, operates responsibly in the newly deregulated market, focusing on its customers with a reliable and cost competitive gas supply policy and quickly adjusting to new market circumstances.

High Pressure Networking in Slovenia



Geoplin d.o.o. Ljubljana began operation in 1975, the year marked by the beginning of the construction of the Slovenian natural gas pipeline system, followed in 1978 by the connection of the first consumers to the network. As of today, Geoplin is well positioned to compete strongly in a liberalised internal gas market and to expand its range of activities.

Geoplin as a wholesale gas supplier, has well diversified supply portfolios of long and short-term contracts, thus securing the Slovenian energy market with an adequate natural gas supply.

Implementation of European Gas Directive 2003/55/EC resulted in the legal unbundling of commercial activities from transmission activities. And, from 2005, Geoplin's core business is the supply of natural gas, whereas the transmission system operator's activities are performed independently by Geoplin plinovodi d.o.o, a daughter company owned by Geoplin.

In line with gas demand growth in the past ten years and new market regulations, Geoplin follows supply and infrastructure standards by investing in new pipeline infrastructure being built in Slovenia by Geoplin plinovodi. In addition, Geoplin, subject to its obligation to guarantee security of supply, has set up preventive action and emergency plans in case of supply disruption.

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geoplin

GEOPLIN
Cesta Ljubljanske brigade 11
1001 Ljubljana
Republic of Slovenia

During their fourth meeting WOC 3 delegates enjoyed a concert at the San Domenico Palace Hotel in Taormina.

- Abderrahmane Taberkokt on gas transmission in Algeria; and
- Daniel Falabella of TGS (Argentina) on the GIS software application for managing the TGS work permit system.

Fourth meeting

The venue for WOC 4's fourth meeting was Sant'Alessio Siculo on the Italian island of Sicily, where the breath-taking views made it a challenge to stay indoors. It was hosted by ENI Snam Rete Gas and held on May 25-27. Unfortunately some members from the Scandinavian countries had to cancel at the last minute when their airspace was closed due to the presence of volcanic ash from an eruption in Iceland.

The meeting was chaired by Benjamin Guzman, WOC 3 Vice Chair. Benjamin thanked ENI Snam Rete Gast for choosing an excellent venue and conveyed Eric's regret for not being able to join the fourth meeting. He went on to welcome the 45 participants from 22 different countries including Ungku Ainon Ungku Tahir, CC Secretary.

Nicola Batillana, on behalf of Snam Rete Gas also welcomed WOC 3 members to Sant'Alessio Siculo and gave a presentation on the gas industry in Italy. Jeanet van Dellen from the IGU Secretariat in Oslo presented an update on general IGU matters. She was followed by Ungku Ainon Ungku Tahir who gave updates on the CC's activities and the organisation of the 25th World Gas Conference.

Benjamin Guzman thanked the Study Group leaders and their members for the detailed progress reports. He called on all WOC 3 members to inform their Study Group about best practices in their respective companies in order to contribute to the best practices initiative for WGC2012.

Moving forward, Rein Bolt, WOC 3 Secretary explained that as the Committee aspired to be the spokesman for gas transmission, it should maintain a database with key information on the gas transmission systems represented by the members. Delegates supported his idea and Rein will make a proposal to include this in WOC 3's activities for the 2012-2015 TWP.

Three presentations were given during the plenary session by:

- Carlo Spinelli of ENI Gas & Power (Italy) on developments in long-distance, high-pressure gas transmission with a focus on the use of high-strength steel in long onshore pipelines;
- Arthur Braga of the Pipeline Technology Centre – CTDUT (Brazil) on CTDUT's work including a project for a 16in-diameter, 2.4km, gas

pipeline dedicated to testing, training and research; and

- Ian Fordyce of GL Noble Denton (UK) on a plant enquiry system called EAGLES which National Grid has developed in the UK.

Study Group reports

The three Study Groups held their meetings a day before each plenary WOC 3 meeting and presented their progress reports in the plenaries.

SG 3.1 *Strategic gas transmission infrastructure projects*
Leader: Enno Freese (The Netherlands)
At the Rio meeting, Enno presented his progress report and said that 15 Study Group members were present. One of SG 3.1's tasks is to make an inventory of strategic pipeline projects, to analyse the differences and similarities of the selected projects and finally to describe the typical problems /challenges/conditions and chosen solutions. He mentioned that nine strategic pipeline projects have been chosen, almost all information has been collected and the first analyses are being carried out. For the chapter "Construction of pipelines under extreme conditions", three topics have been chosen: horizontal directional drilling, micro tunnelling and direct pipe.

At the fourth meeting, Enno presented a summary of the seven chapters and shared some early and very interesting conclusions and recommendations. Every chapter has a so called "chapter owner" responsible for its content. Moving forward, at the next (fifth) meeting, the final draft of the Study Group report will be discussed and all members will be asked to approve the content.

SG 3.2 *Integrity of gas transmission systems and footprint reduction*
Leader: Mohd Nazmi bin Mohd Ali Napiah (Malaysia)
Nazmi presented his progress report at the Rio meeting which was attended by 19 Study Group members. He said that responses to the questionnaire sent out to all WOC 3 members would be analysed and the main conclusions discussed. The next step will be to investigate best practices, new technologies and lessons learnt as regards the integrity of gas transmission systems and footprint reduction programmes.

At the fourth meeting, chapter owners were appointed. SG 3.2 is on track and members will discuss the final draft of the Study Group report at the next meeting.

SG 3.3 *Securing sufficient expertise to operate gas transmission systems safely and adequately*
Leader: Barbara Jinks (Australia)
Barbara presented her progress report at the Rio meeting and said that 11 Study Group members were present. SG 3.3 has now obtained datasets from all IGU regions and has six competency matrices and two case studies. Members are making good progress in drafting the final report but it is disappointing that no information has been received from some major gas countries. Chapter owners have been appointed and the final draft of the Study Group report will be discussed at the next meeting.

Technical visits and social events

Delegates to the third meeting took part in a social event at the Rio Yacht Club and a technical visit to the TECAB gas processing plant at Cabiúnas in Macaé municipality. This plant is one of the largest in Brazil with a capacity of 16 mcm/day, processing most of the natural gas from the Campos Basin.

Delegates to the fourth meeting took part in a social event at the San Domenico Palace Hotel in Taormina and a technical visit to the Messina Compressor Station. This important facility serves three import pipelines from North Africa (Algeria and Libya) to Italy. Two of the pipelines are of 48in diameter with the third 42in, and the total installed power is 146 MW.

Working Committee 4 – Distribution

The fourth meeting of WOC 4 was kindly hosted by Bord Gáis in Dublin, Ireland, March 22-25. The Committee's meetings regularly reach their targets in terms of activities, results achieved and attendance, and this was no exception. More than 40 delegates took part, ensuring a continuity that is not possible if there is a large turnover, and giving access to a significant shared basis of experience and knowledge. Moreover, 15 accompanying persons had the opportunity to enjoy the dedicated programme arranged by the host, enjoying the city and its history.

As usual, the meeting started with an introduction by the host company. Willie Kearney and Declan Burke of Bord Gáis looked at the development of the gas industry in Ireland, focusing on design innovations and strategic projects recently completed.

A famous Dubliner: Molly Malone.

Next, topics under study by the Committee were addressed. David Hughes from Bord Gáis looked at risk management and safety management systems, with an interesting analysis of a series of related key performance indicators (KPIs). Then there was a presentation on the smart metering project under development by Bord Gáis, while Steven Vallender from National Grid UK gave an overview of the UK experience as regards unaccounted-for gas (UFG). Finally, Jeremy Bowman from Radius Systems described the benefits of installing skinned polyethylene pipes, followed by a small exhibition of these pipes.

From the afternoon, the work went on as usual via separate meetings of the three Study Groups. They began by reviewing the activities initiated by the previous meeting and discussed the results of the questionnaire that had been circulated. They then focused on preparing the first draft of their reports which will be included in the final WOC 4 report for WGC2012.

SG 4.1 *Gas distribution safety management systems*

Leader: Ben Lambregts, Liander (The Netherlands)

SG 4.1 is studying the process and methodologies used to develop and improve safety management systems. There will be a focus on:

- Process safety leadership;
- Human factors and competence;
- Inspection and maintenance of the network; and
- Emergency arrangements and response as well as audit, review and regulatory topics.

The most important KPIs will be presented as well as a number of recommendations for improvement.

SG 4.2 *Smart metering systems: characteristics, technologies and costs*

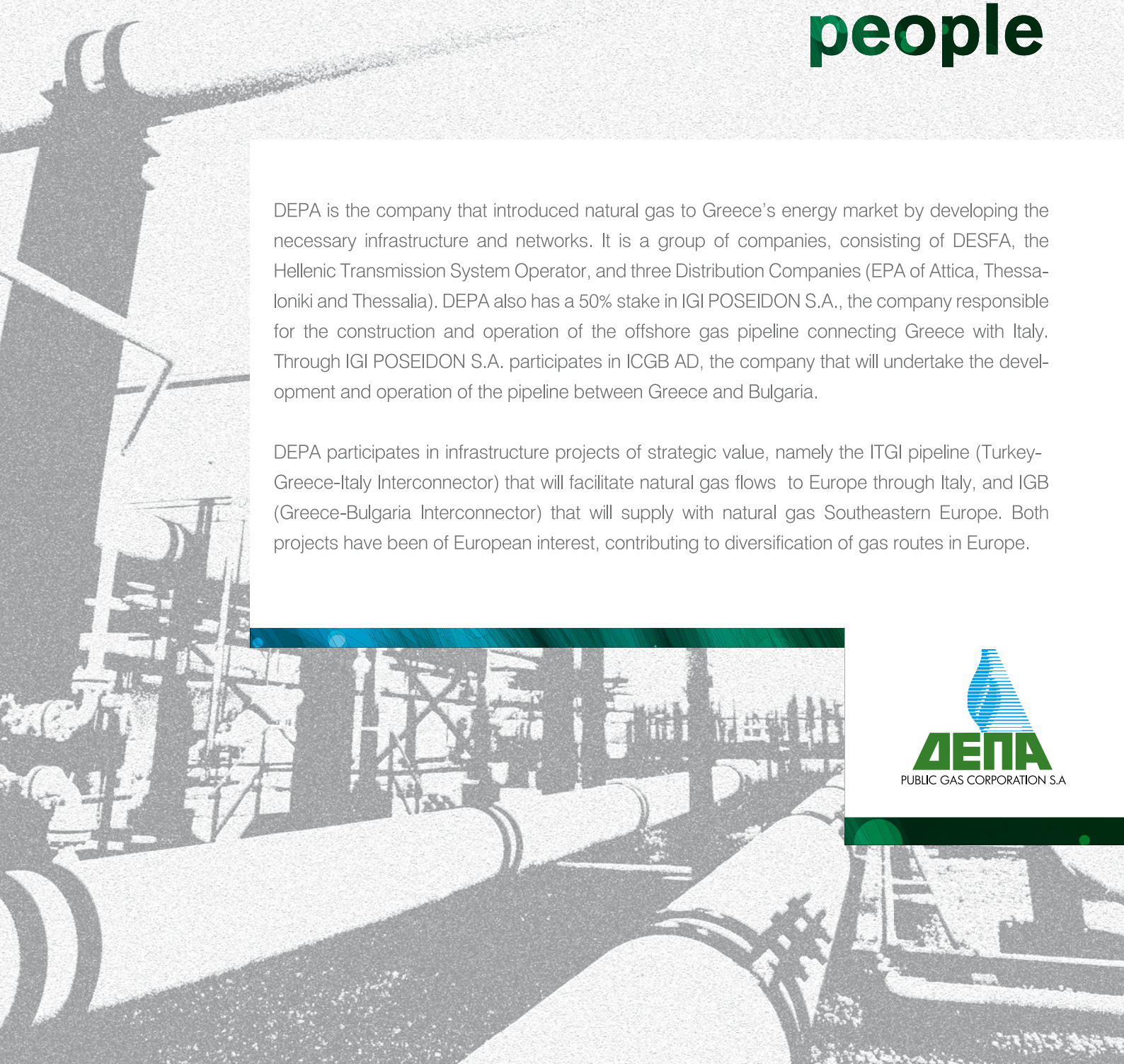
Leader: Kim Vrancken, Eandis (Belgium)

The aim is to review the various technologies available and to identify the best practices in smart gas metering activities, focusing on:

Growth that connects people

DEPA is the company that introduced natural gas to Greece's energy market by developing the necessary infrastructure and networks. It is a group of companies, consisting of DESFA, the Hellenic Transmission System Operator, and three Distribution Companies (EPA of Attica, Thessaloniki and Thessalia). DEPA also has a 50% stake in IGI POSEIDON S.A., the company responsible for the construction and operation of the offshore gas pipeline connecting Greece with Italy. Through IGI POSEIDON S.A. participates in ICGB AD, the company that will undertake the development and operation of the pipeline between Greece and Bulgaria.

DEPA participates in infrastructure projects of strategic value, namely the ITGI pipeline (Turkey-Greece-Italy Interconnector) that will facilitate natural gas flows to Europe through Italy, and IGB (Greece-Bulgaria Interconnector) that will supply with natural gas Southeastern Europe. Both projects have been of European interest, contributing to diversification of gas routes in Europe.



ΔΕΠΑ
PUBLIC GAS CORPORATION S.A

- The role the gas meter plays today in a gas distribution company;
- The role a smart gas metering system can play tomorrow in a gas distribution company;
- Smart gas metering technologies; and
- What kind of costs and benefits does a gas distribution company include in their cost benefit analysis?

SG 4.3 *Unaccounted-for gas: identification, measurement, calculation and management*
Leader: Barbara Jinks, GHD (Australia)
The concept of UFG will be addressed including a definition, the identification of its main components and discussion of approaches adopted for its management. There will be case studies on:

- Theft and fraud;
- Permanent leakage and mains replacement programmes;
- Tools to develop models to calculate UFG;
- Major gas loss during operations;
- Metering inaccuracy and its management; and
- Gas loss due to third-party damage.

After the two work days all Study Groups reached their targets, having their first drafts ready to be fine-tuned during the months to follow.

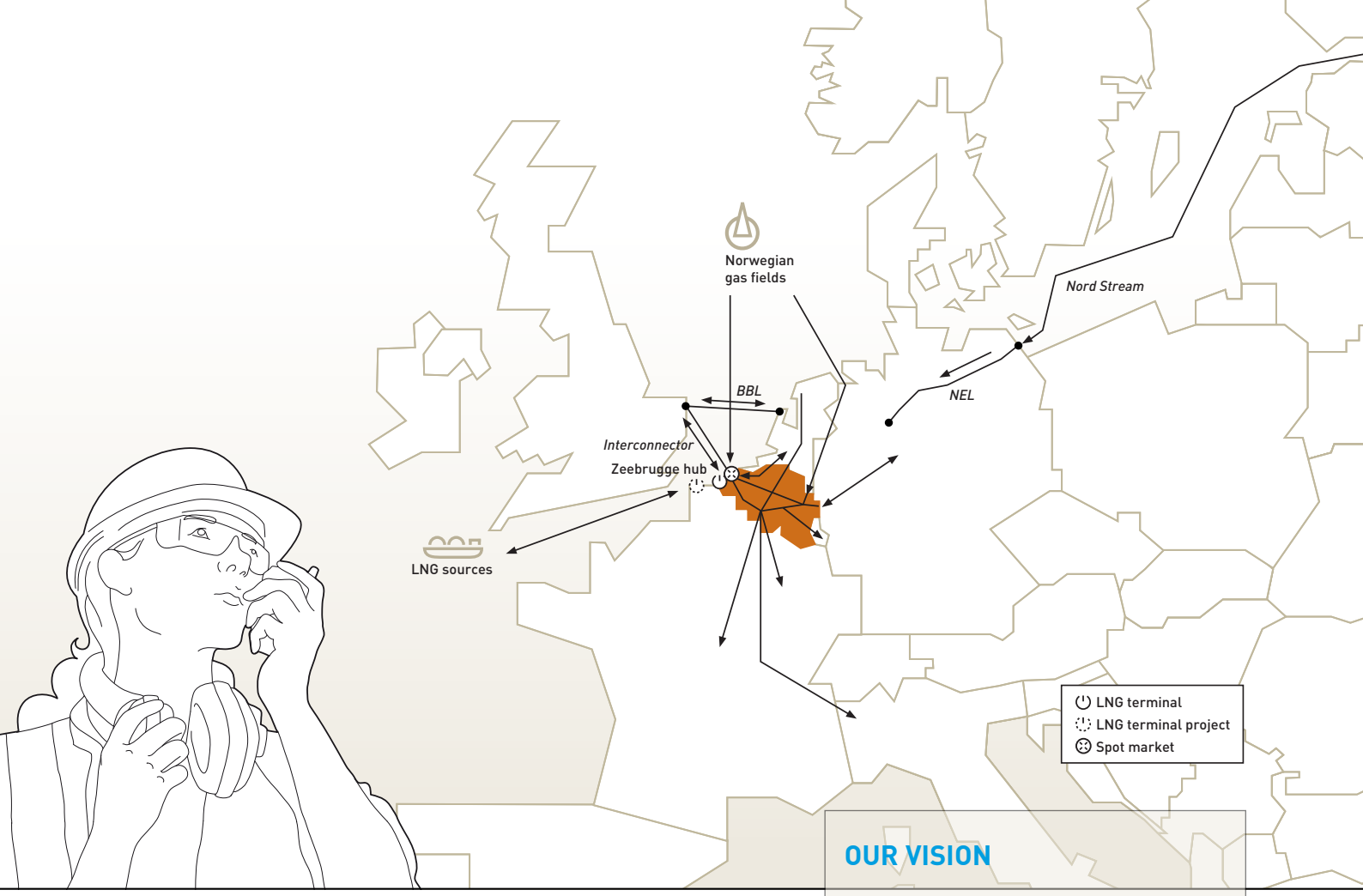
WOC 4 members enjoying the visit to the Guinness Storehouse.

The Study Groups also analysed the themes of the three WOC 4 Committee Sessions (one for each Study Group) during the 25th World Gas Conference and agreed on their general structure. This will be adjusted during next meeting when the selection of submitted abstracts is made.

During the plenary session of the meeting, we engaged in a very positive debate to finalise WOC 4's programme at the WGC, discussing in detail how to manage the two Expert Fora. The final decision was to address the three topics selected (safety management systems, smart metering and UFG) during both sessions, but to approach them from two different perspectives: technical and managerial. In fact, technical improvements are required to manage issues arising from the industry, so WOC 4 wants to highlight best practices and innovative technical approaches adopted around the world. On the other hand, we are aware that technical solutions must be selected and adopted on a global basis in order to allow them to display all their benefits and add value to the business.

The plenary session concluded with an update by Pascal Vercamer on the programme of IGRC2011 that will be held in Seoul, Korea, October 19-21. Pascal reported that almost 300 abstracts had been submitted. The conference will highlight technical innovations and tendencies in the gas industry and one of the sessions will be focused on gas distribution.

Traditionally WOC 4 meetings are rounded off with a "social-technical" tour. This time we visited one of Dublin's landmarks: the Guinness Storehouse. Here we had the opportunity to learn about the brewing process, cooperage and even the building itself, discovering the secrets of a perfect brew to produce the masterpiece that is a pint of Guinness. The tour ended on the seventh floor of the Storehouse, where we enjoyed panoramic views of Dublin and a pint of Guinness (not necessarily in that order!).



OUR VISION

The natural gas transmission market in North-Western Europe is evolving into a virtual cross-border unity. The companies of the Fluxys Group wish to play a key role in developing this integrating market into an efficient system for suppliers to move natural gas flexibly from any border point in the region to their customers.

BUILDING A STRONG NATURAL GAS MARKET IN NORTH-WESTERN EUROPE

> Enhancing security of supply
> Strenghtening the well-functioning of the market
> Promoting cross-border natural gas flows and transfers

Belgian network: natural gas crossroads

- **Excellent upstream interconnection: LNG and pipe gas**
  - > tied in to all pipe gas sources available to the European market
  - > capacity to accommodate Nord Stream gas flows
  - > worldwide LNG supply through the Zeebrugge LNG terminal
- **Optimum downstream destination flexibility: take away capacity to all neighbouring countries and systems**
- **Long-term storage opportunities**
- **Zeebrugge Hub: one of the leading spot gas markets in Europe**

Fostering integration

To foster the integration of the North-Western European natural gas market, the Fluxys Group develops a profitable set of stakes in and industrial partnerships with companies in the business of natural gas transmission and storage, LNG terminalling and spot market facilitation.

- Flows between the UK and the continent: Interconnector and BBL pipelines
- Downstream flows from Nord Stream through NEL pipeline
- Dunkirk LNG terminal: additional LNG into North-Western Europe

Next meeting

At presstime, WOC 4's next meeting was due to be hosted by Geoplin Plinovodi in Ljubljana, Slovenia, September 20-23. The Committee currently has around 80 members (some of them as corresponding members) and new members are still more than welcome to join. For more information contact the Chairman, Alessandro Soresina at alessandro.soresina@a2a.eu or the Secretary, Mario Pelizzoli at mario.pelizzoli@a2a.eu.

● Working Committee 5 – Utilisation

Held March 2-4, the fourth WOC 5 meeting was kindly hosted by Eni Gas and Power in the pleasant Mediterranean coastal city of Livorno in the Tuscany region of Italy. Thanks to excellent organisation by the Eni team, this meeting was very productive. The number of participants was a record for this Triennium with 45 delegates, 14 accompanying persons and eight guest speakers.

Plenary sessions

The first part of the plenary meeting started with a report from the CC Chairman, Ho Sook Wah, who updated members on recent IGU activities and the preparations for WGC2012. This was followed by two presentations from the host country. Eni Gas and Power gave an overview of the gas and power business in Italy and the Italian Gas Committee, which is the IGU Charter Member for Italy, explained its role and activities.

In the second part of the plenary meeting there was a special session on gas quality, which was co-chaired by Jean Schweitzer and Daniel Hec. The issues and actions taken concerning gas quality harmonisation in the European grid were introduced and discussed. This important topic will be covered in one of WOC 5's Expert Fora at WGC2012.

Technical visit

There was a technical visit to a multi-energy fuel station operated by Eni near Livorno. The station opened in July 2006 and handles various automobile fuels such as gasoline, diesel, natural gas and hydrogen. It also generates its own electricity using photovoltaic panels, three wind turbines and a micro gas turbine. Members were very impressed by the fuel station's practical use of advanced technologies.

Study Group meetings

The three Study Groups of WOC5 had intense and productive meetings.

SG 5.1 *Industrial utilisation*
Leader: Nuno Afonso Moreira (Portugal)
Deputy Leader: Egidio Adamo (Italy)
The topics and related keywords of the Call for Papers for WGC2012 were advised, while the structure of the Committee Session was discussed and agreed. As regards SG 5.1's report, the

There was a record attendance at WOC 5's fourth meeting.

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We are all of great value to our families, coworkers, and community, and our individual actions can affect others and the environment far beyond ourselves.

Because of our ability to influence so broadly, it is our personal responsibility as stewards of the earth to ensure care and sensitivity for the people and environment around us.

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WOC 5 members were impressed by Eni's multi-energy fuel station.

analysis of completed questionnaires was discussed and the remaining report chapters were assigned to members.

SG 5.2 *Domestic and commercial utilisation*
Leader: Martin Seifert (Switzerland)
Deputy Leader: Frédéric Pastier (France)
Three European gas appliance manufacturers were invited to the meeting for a discussion about exchanging information on micro-CHP and gas absorption heat pumps and marketing strategies.

Topics for the Committee Session at WGC2012 were discussed and the team decided to focus on three: 1) heat pumps – gas and hybrid; 2) micro-CHP – engine technologies; and 3) fuel cells – chemical production of heat and electricity. Criteria for paper selection and action plans for preparing the session were also discussed and agreed.

As for the SG 5.2 report, technological road-maps were assigned and submission dates agreed,

SG 5.3 *Natural gas vehicles*
Leader: Eugene Pronin (Russia)
Deputy Leader: Davor Matic (Croatia)
Key dates for the WGC2012 Call for Papers were advised and the preliminary programme of the Committee Session was discussed.

Work on the SG 5.3 report is progressing as scheduled. So far, profiles of 18 countries have been provided. During the meeting there were presentations on four special topics which will be included in the final report. In addition, members exchanged information on international NGV activities.

WOC 5 sessions at WGC2012

At the WOC 5 steering committee meeting held prior to the fourth meeting, the preliminary programme and the titles for the WOC 5 sessions at WGC2012 were agreed. There will be three Committee Sessions and two Expert Fora:

- 5.1: Industrial utilisation, "Stimulate gas

demand using energy efficiency technologies";

- 5.2: Domestic and commercial utilisation, "Gas innovation roadmap for the new sustainable market demand";
- 5.3: NGVs, "Solution for a low-carbon society";
- EF 5.A: "How to integrate renewable power in the natural gas grid"; and
- EF 5.B: "Gas quality changes, impact and remedies".

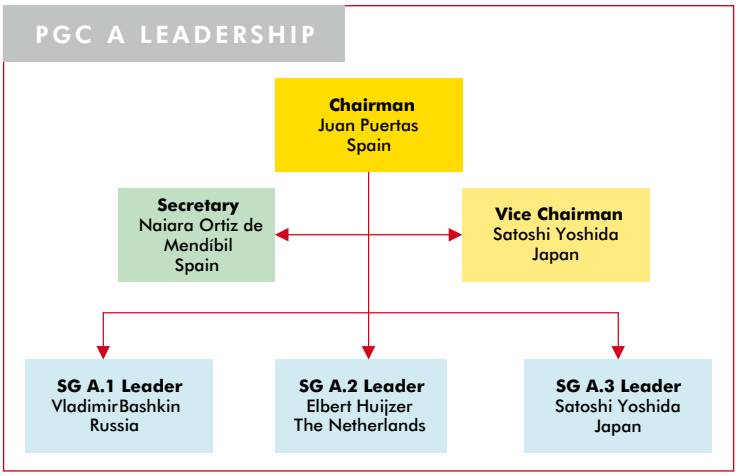
Next meeting

At presstime, WOC 5's fifth meeting was due to take place in Pinhão, Portugal, September 11-14.

● Programme Committee A – Sustainability

PGC A has 62 nominated members from around the world and held its third meeting of the 2009-2012 Triennium in Belgrade, Serbia, March 2-4. The meeting was hosted by Srbijagas and attended by 36 delegates.

On the first day, Mostafa Kashkooli, Vice President of the National Iranian Gas Company (NIGC) gave a presentation on his company and the gas industry in Iran. On the last day, delegates visited the main compressor station for the gas supply to Serbia and Bosnia & Herzegovina.



ABOVE
Figure 1.

Scope and objectives of the Study Groups

SG A.1 *Sustainability and investment*

Leader: Vladimir Bashkin, Gazprom (Russia)

SG A.1's objectives are to:

- Design a hydricity (i.e. the complementary use of hydrogen and electricity) model in which the role of natural gas as a transition fuel will be analysed;
- Present the best hybrid solutions between

Delegates to PGC A's second meeting pose for their group photo.

PGC A delegates during their technical visit to the Batajnica compressor station.

renewable energies and natural gas in a video; and

- Study the state of development of CCS technology and analyse the implications for the gas industry.

Study Group members discussed a preliminary hydricity model and the list of speakers to be invited to the Expert Forum on this topic, which will be organised as a roundtable. A preliminary schedule for the Expert Forum was prepared.

As regards making the video about natural gas and renewable energies, a contract has been signed with a German company and the following projects will be covered:

- Double effect solar – gas cooling plant in Seville (Spain);
- Intelligent building in Burlington (Canada);
- Waste to energy incineration plant (Finland);
- Parabolic solar gas in Abu Dhabi (UAE);
- Gas heat pump in Milan (Italy); and
- Mini heat power station in Russia.

Members were asked to think about the people who will be invited and a preliminary schedule for the Strategic Panel was prepared.

For CCS there will be a joint Expert Forum with WOC 2 and the PGC A report will be the basis for the introduction. Papers selected from the Call for Papers will be presented and the session will be moderated by WOC 2's Chair.

SG A.2 *Integrating other gases into the natural gas industry*

Leader: Elbert Huijzer, Liandon (The Netherlands)

The Study Group aims to set the basis for the natural gas industry to take advantage of these gases, eliminating any possibility of impact on people's health and the useful life of installations.

During the meeting in Belgrade, members deliberated on the drafts of some parts of the report and agreed to send their feedback and comments to the authors for consideration. For other parts of the report, SG A.2's leader will integrate contributions into one draft, incorporating some information from documentation sent by WOC 5 and PGC E.

SG A.3 *Reduction of gas emissions*

Leader: Satoshi Yoshida, Tokyo Gas (Japan)

SG A.3 aims to record best practices in the gas value chain and develop a comprehensive industry guide to reduce gas emissions, which provides for a reduction in emissions in each process and in the environmental impact of each activity.

During the Belgrade meeting, the Study Group worked on revising the drafts presented by some members, and also charted the schedule and work plan for the next meeting in Russia. It was agreed that all chapters of the draft report would be completed and circulated to IGU members and other institutions for comments. The target is to start circulating the draft in October with comments due by the end of this year. The Study Group leader also prepared an article for the IGU Magazine entitled "The Great East Japan Earthquake and its Effect on Japan's Energy Policy" which is published in this issue on pages 190-195.

WGC2012 preliminary programme for PGC A

PGC A will have five slots during WGC2012.

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PGC A MEETINGS

Meeting	*Date*	*Venue*
1st meeting	February 10-12, 2010	Barcelona, Spain
2nd meeting	September 15-17, 2010	Tokyo, Japan
3rd meeting	March 2-4, 2011	Belgrade, Serbia
4th meeting	September 6-9, 2011	Moscow, Russia
5th meeting	February 1-3, 2012	Milan, Italy

ABOVE
Table 1.

There will be two Committee Sessions:

- SG A.2: "Integrating other gases into the gas natural industry"; and
- SG A.3: "Greenhouse gas (GHG) emission reduction efforts.

There will be two Expert Fora:

- SG A1.1: "The role of natural gas in the design of a hydricity model" and
- SG A1.3 and WOC 2: "CO_2 capture, transport and sequestration: technologies involved and project developments to increase the gas industry's sustainability".

There will also be a Strategic Panel to present the video "Natural Gas and Renewables", a joint project with PGC E and the CC.

Future meetings

Details of PGC A's meetings are shown in *Table 1*. At presstime, the next one was due to be held in Moscow, September 6-9, as a joint meeting with PGC C.

● Programme Committee B – Strategy

PGC B now has 132 members, six new members having joined since the September 2010 meeting in Oran. The Committee held its third meeting in Washington DC, USA, March 9-10. Fifty-nine senior gas representatives from 44 different organisations in 27 countries joined in the working sessions and debate with leading global experts in Washington. The meeting was generously hosted by the American Gas Association (AGA), which was a fantastic opportunity to learn more about America's leading gas body.

Before the main committee meeting, a joint workshop with the International Confederation of Energy Regulators (ICER) was held at the offices of Hogan Lovells, dedicated to exploring natural gas issues of global significance. Lord Mogg, Chair of ICER and Datuk Abdul Rahim Hashim, President of the IGU, welcomed delegates to the workshop, following which there were keynote presentations and discussions from industry and regulatory leaders. A full report on the groundbreaking workshop can be found on pages 198-201.

The core objective of the committee meetings was for the Strategy Committee to share the outputs from the last six months and continue the progress from the last meeting. The Study Groups held individual sessions, led by their respective group leader.

SG B.1 *World gas supply, demand and trade*
Leader: Jaap Hoogakker, GasTerra (The Netherlands)

PGC B delegates pose for their group photograph during their visit to FERC's headquarters in Washington DC.

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PGC B's Chairman, Colin Lyle addresses delegates in Washington DC.

There was an update on supply, demand and trade for each of the eight IGU regions, along with an update on global trade. Detailed analyses were presented and debated by experts responsible for different parts of the world, along with a high-level snapshot of development scenarios to 2030 for each region.

SG B.2 *Wholesale gas price formation*
Leader: Mike Fulwood, Nexant (UK)
There were presentations on the four core areas of investigation (price convergence, price formation, the impact of carbon taxes/cap and trade and regional pricing models). Also presented were in-depth studies of the Indian gas market and competing fuel analyses, while there was a vigorous discussion about the "commoditisation" of natural gas.

SG B.3 *Corporate Strategy and Regulation*
Leader: Francisco de la Flor, Enagás (Spain)
There were presentations of corporate strategies and a technical paper on the US Federal Energy Regulatory Commission (FERC) and the Agency for the Cooperation of Energy Regulators (ACER). The meeting was also an opportunity to share and discuss several recently submitted corporate case studies, including those of Petronas, GDF SUEZ and Eni.

Future projects and technical visit

SG B.1's regional supply and demand model is on target for completion, with the new base case for all regions completed in December 2010. This was one of the main topics of discussion at the Washington meeting, and an updated draft was issued in April.

SG B.2 has been updating the wholesale price formation database, examining national and regional price formation methods and prices ranges, with further data collection planned before the end of this year.

Following the success of the joint ICER-IGU workshop, SG B.3 is exploring options for holding a second joint meeting during the Malaysian Triennium. More details will be issued on the IGU website in due course.

Prior to the main meeting, FERC hosted a technical visit to their headquarters and market monitoring centre, an interactive facility for ensuring that the natural gas market operates in a transparent and fair manner.

The Committee leadership team would like to thank Hogan Lovells, FERC and the AGA for their generosity and for making the meeting such a success.

All the presentations from the Washington meeting can be found on the IGU website, along with updates and details of future meetings. Please contact Harry Whitaker (harry.whitaker@bg-group.com) if you require any further information.

At presstime, the next meeting was due to be hosted by GAIL in New Delhi, India, September 14-15.

● Programme Committee C – Gas Markets

PGC C's third meeting was hosted by Petrobras America in Houston, March 1-4. Attendance set another record with 37 delegates from 16 countries.

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Sonangol EP is the exclusive Concessionaire for liquid and gaseous hydrocarbons in Angola. Its activities include exploration, production, commercialisation and refining of hydrocarbons and their derivatives.

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practices remain a priority and are the standards Sonangol will continuously improve to achieve excellence.

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Delegates were particularly interested in presentations given by Andrew Ware of Cheniere on the Sabine Pass liquefaction project and David Pruner of Wood Mackenzie on North American shale gas. Hydraulic fracturing has certainly made large quantities of shale gas readily available to North American consumers at very attractive prices, but producers quickly moved their E&P portfolios to liquids when gas prices started to decouple from oil. Both presentations are available from PGC C's section of the IGU website.

The current Triennium is drawing to a close and PGC C members need to exchange large files to complete the committee report. To help them the secretariat has created a file exchange tool using Lotus Quickr software at http://quickri.petrobras.com.br/intergu. A Google account has also been set up to facilitate the exchange of photographs (access is for PGC C members only).

SG C.1 *ASEAN+4*

SG C.1 has prepared an article for the IGU Magazine "The Asian Gas Market: Challenges and Potential" (see pages 182-188).

The session the Study Group is organising for WGC2012 will be entitled "Asia: gas market no.1?" and will look at actions to increase security of supply in the region, such as the promotion of regional integration and the development of alternative sources that are readily available in Asia-Pacific. Topics of interest include sustainability and reliability of supply, unconventional gas developments in the region, LNG imports, regulatory tendencies, infrastructure development and financing.

The plenary session of PGC C's third meeting.

SG C.2 *North America*

SG C.2's WGC2012 session will debate key market drivers, emerging issues and challenges for the gas industry in the United States, Canada and Mexico. A group of invited speakers is expected to promote an in-depth debate on the business environment, shale gas, the role of LNG in North America and the use of natural gas in transportation, industrial plants and power generation.

North America has been the main stage for unprecedented developments in the natural gas industry. The region not only hosts the largest natural gas markets in the world, but is also reshaping itself frequently, setting new trends worldwide.

SG C.3 *Europe and Russia*

SG C.3 has investigated the gas markets in Europe and Russia, with an emphasis on growth potential, security of supply, price and regulation. The region is one of the most interesting and complex in the world, with demand centres located far from the reserves, varied energy policies and markets at different maturity stages.

A number of supply constraints – especially in the midstream segment of the gas value chain – have been reducing potential demand in the region. These constraints include the availability of pipelines, storage facilities and LNG infrastructure.

As a consequence, the Study Group's WGC2012 session will debate how to best combine variables such as portfolio and supply diversity, marginal

PGC C delegates and invited speakers at the Houstonian Hotel.

volumes and system integrity to maximise security of supply, while protecting the interests of suppliers, importers, traders, consumers and general stakeholders.

The growth potential for natural gas has always been a major focus of attention, but some key drivers must be revisited considering the peculiarities that subsist in mature and developing markets, such as price competitiveness, technology, efficiency, CO_2 emissions, natural gas for vehicles, natural gas as feedstock, "side" products and complementarity to renewables.

Finally, a most important theme to be analysed is the regulatory framework, especially the third legislative package for the EU's gas and electricity markets and some of its implementation issues, including the role of national and supra-national regulators, and the current debate on long-term, oil-indexed contracts versus spot and alternative hybrid mechanisms.

Future meetings

At presstime, PGC C was preparing for a joint meeting with PGC A to be hosted by VNIIGAZ, the R&D branch of JSC Gazprom, in Moscow, September 6-9, to debate the impact of renewable energies on gas markets. Representatives of IEA, IHS CERA and IGU were due to present the fundamentals behind their gas scenarios, and a discussion about the future of global warming was also expected.

The last meeting of PGC C in the current Triennium will take place in Paris, February 15-16, 2012.

● Programme Committee D – LNG

PGC D currently has 92 members from 30 countries. The Committee's third meeting was kindly hosted by PGNiG (Polish Oil & Gas Company) in Warsaw, Poland, May 25-27. It was attended by 45 members who had a full programme.

In their respective opening remarks, PGC D Chair, Alaa Abujbara thanked members for their presence and PGNiG for hosting the meeting, Radoslaw Dudzinski, Vice President, PGNiG extended his welcome to members and Jupiter Ramirez outlined the programme for the two-day meeting. Then there were three short presentations on the Polish gas industry. CC Chairman, Ho Sook

PGC D held its third meeting in Warsaw (ABOVE) where delegates posed for a group photograph (BELOW).

Wah was also present to provide updates on IGU and CC activities as well as preparations for WGC2012.

The focus of the meeting was on the collation of information, the structure of report and preparing the first draft. It was agreed that the draft report would be written in the months following the Warsaw meeting and the final version deliberated at the fourth meeting in September. The structure of PGC D's three Committee Sessions and two Expert Fora during WGC2012 were also discussed.

The Head of the Special Task Force on IGU's new LNG publication, Seth Haron from Malaysia, together with Nikos Tsafos from PFC Energy, USA shared the draft *World LNG Report 2010* with the group, seeking views and inputs. Members of the Special Task Force stayed a day later to finalise the report. The *World LNG Report 2010* is sponsored by Petronas and was launched on June 6 at the 16th Asia Oil & Gas Conference in Kuala Lumpur.

The three Study Groups met and shared their outputs from the previous six months.

SG D.1 *Enhance the compatibility of LNG facilities*
Leader: Jean-Yves Capella, Total (France)
The team achieved good progress in their work which was organised into sub groups to review the following topics affecting compatibility:

- Operational safety – LNG facilities and carriers;
- Characteristics of LNG carriers;
- Characteristics of LNG facilities;
- New creative LNG facilities; and
- Outlining and writing the report.

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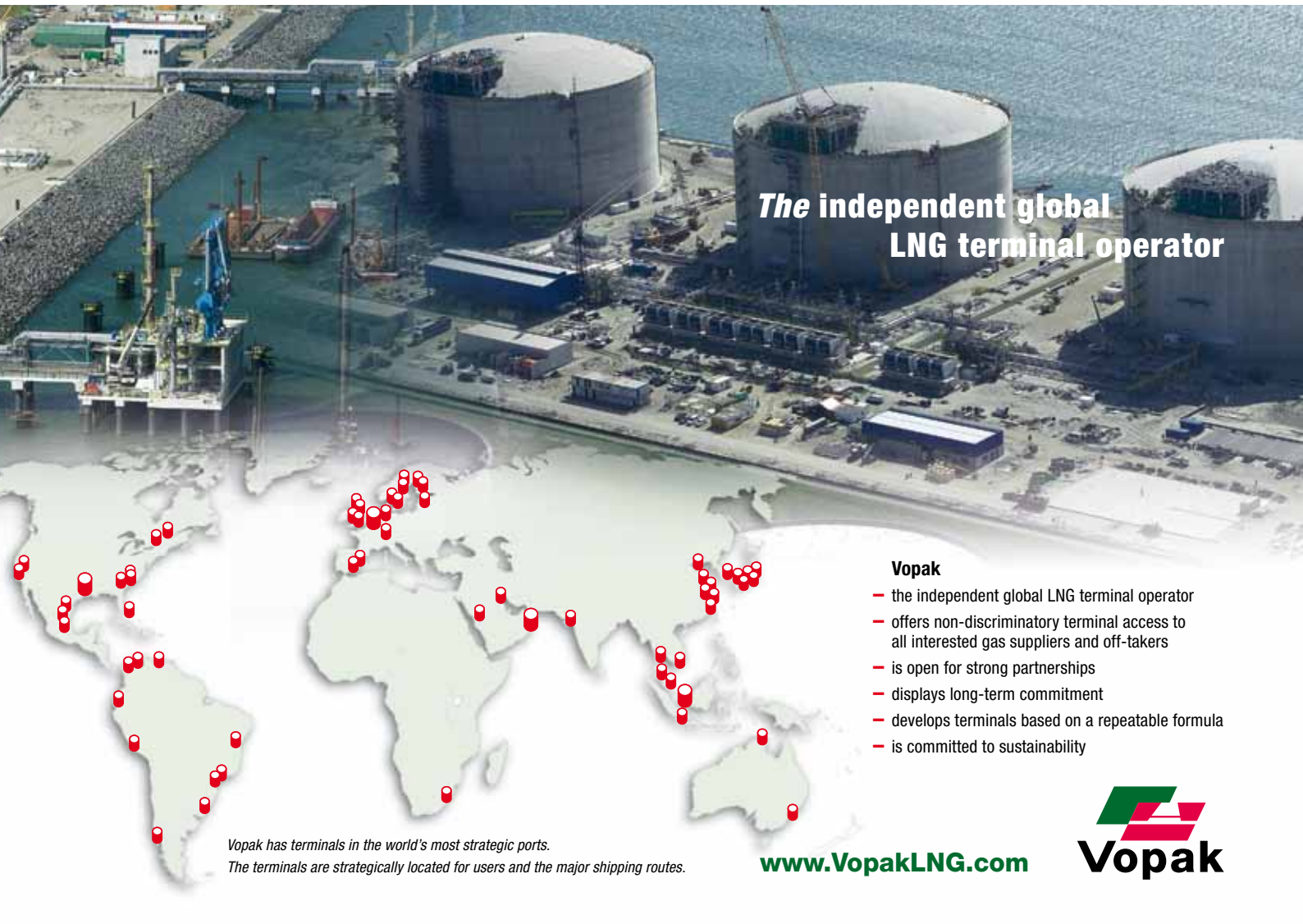

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The focus is in putting all the content that has been gathered into the report and a solid draft is expected to be ready soon. The detailed planning of how the WGC2012session will be organised will be further discussed at the next meeting in Beijing.

SG D.2 *Penetrate new markets for LNG*
Leader: Ted Williams, AGA (USA)
The four regional working groups (Americas, Asia, Europe and the Middle East) have made good progress in the three areas identified and will start to pull together the facts and analyses gathered. The draft report will be discussed at the next meeting. The group spent some time discussing the organisation of SG D.2's Committee Session at WGC2012.

SG D.3 *Enhance efficiency in the LNG value chain*
Leader: Rob Klein Nagelvoort, Shell (The Netherlands)
SG D3 has sub-groups looking into the various topics identified. Work is progressing well although information from Australia is lacking. During the meeting, Wouter Pastoor, VP Business Development of Flex LNG gave a presentation and some time was also dedicated to planing the Committee Session at WGC2012. The team agreed to have the draft of their report ready by the next meeting.

Next meeting

At presstime, PGC D's fourth meeting was due to be held in Beijing, China, September 26-28. The fifth meeting will be in Madrid, Spain, March 5-7, 2012. A special meeting to review the Call for Papers is also planned for some time in October.

For more information, contact the Chairman Alaa Abu Jbara at aabujbara@qatargas.com.qa or the Secretary, Abdulla Ahmad Al-Hussaini at aalhussaini@qatargas.com.qa.

● Programme Committee E – Marketing

PGC E held its fourth meeting in Prague, Czech Republic, May 25-27. It was hosted by RWE Transgas and the Czech Gas Association and was attended by 24 members from 13 countries.

During the two days in Prague, delegates had a full programme with various interesting presen-

Delegates to PGC E's fourth meeting pose for their group photograph (ABOVE) before getting down to work (OPPOSITE).

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tations as well as a tight working schedule within the Study Groups. The preparations for WGC2012 are well under way and the Committee's report will be drafted in order to be able to discuss the final version during the next meeting in November.

SG E.1 *Natural gas and renewables*
Leader: Uwe Klaas, DVGW (Germany)
SG E.1 is identifying the position of, and opportunities for, natural gas in combination with renewables in the future energy market. During the Prague meeting, members concentrated on the report structure and its content. There were also discussions about the organisation of the joint session with SG E.2 which will be held on June 7, 2012. This issue was discussed in more detail during an extra meeting in July of core members of the two Study Groups. The objective is to create a lively session, which will attract a large number of participants despite a late afternoon slot on the third day of the conference. SG E.1's report will be finalised during the next meeting in November.

SG E.2 *Marketing campaigns*
Leader: Urs Zeller, Swiss Gas Industry Association (Switzerland)
SG E.2 is analysing business behaviour in marketing across different sectors. The target groups are wholesalers and retailers. A questionnaire has been circulated to IGU members to collect information and around 50 answers have been received.

During the meeting, members discussed the first results and drafted the report structure. They also discussed the WGC2012 presentation. The idea is to present the results of the survey and derive conclusions about business behavior as well as to show the different marketing mixes used in each sector. Examples of different marketing campaigns will be given, highlighting the key factors of their success as well as pitfalls and possible failures.

It was decided that the results of the survey will be illustrated by diagrams and charts with explanatory comments. Over the coming months the report will be written in close coordination with the Study Group members. The final version will be discussed during the next meeting in November.

SG E.3 *Image of natural gas*
Leader: Hansch van der Velden, Nederlandse Gasunie (The Netherlands)
SG E3 is investigating the image of natural gas and the drivers of successful communication and advocacy activity in this area. The Study Group's main purpose is to develop IGU guidelines on communications strategies to support the gas industry in improving the image of gas. During the meeting, members worked intensively on the workstreams and defined the next steps.

The Study Group agreed on a vision statement for natural gas "Human, open and shaping the future", which will be presented at WGC2012. The vision underlines the importance of the gas industry communicating personally and directly as well as being open, transparent and pro-active, and emphasises that gas has a role in the future energy mix.

The report structure was agreed and SG E.3's work is now split into three project workstreams.

- *Country case studies* – The country case studies investigate the role and image of gas in 10+ countries around the world, by using a questionnaire and carrying out expert interviews. The studies also identify advocacy campaigns and their impact. The countries investigated include Brazil, Denmark, France, Germany, Iran, Italy, Japan, The Netherlands, Norway and Russia. Studies for China, Malaysia and the USA are currently pending.
- *Online gas advocacy platform* – The Study Group wants to give a precise recommendation to IGU on how to further strengthen its online presence.
- *WGC2012* – SG E.3 will organise a panel discussion on the second day of the conference (June 6, 2012). Entitled "Winning communication strategies for natural gas", the session will bring together business leaders and experts in the field of reputation management, corporate communications and public affairs.

PGC E's Secretary, Barbara Schmid lights a gas lamp during an evening tour of Prague.

In order to support the WGC session, the Study Group will start a YouTube channel (GasLinx) to share gas videos. It will investigate the possibility of making video testimonials in which members of the general public are asked for their opinion on gas.

Miscellaneous

PGC E currently has 65 members and two corresponding members from 23 countries, and new members are still welcome.

The next meeting will take place in Athens, November 21-23, by kind invitation of DEPA, the public gas supply corporation of Greece.

For more information, please contact the Chairman, Marc Hall at Marc.Hall@bayerngas.de or the Secretary, Barbara Schmid at Barbara.schmid@bayerngas.de.

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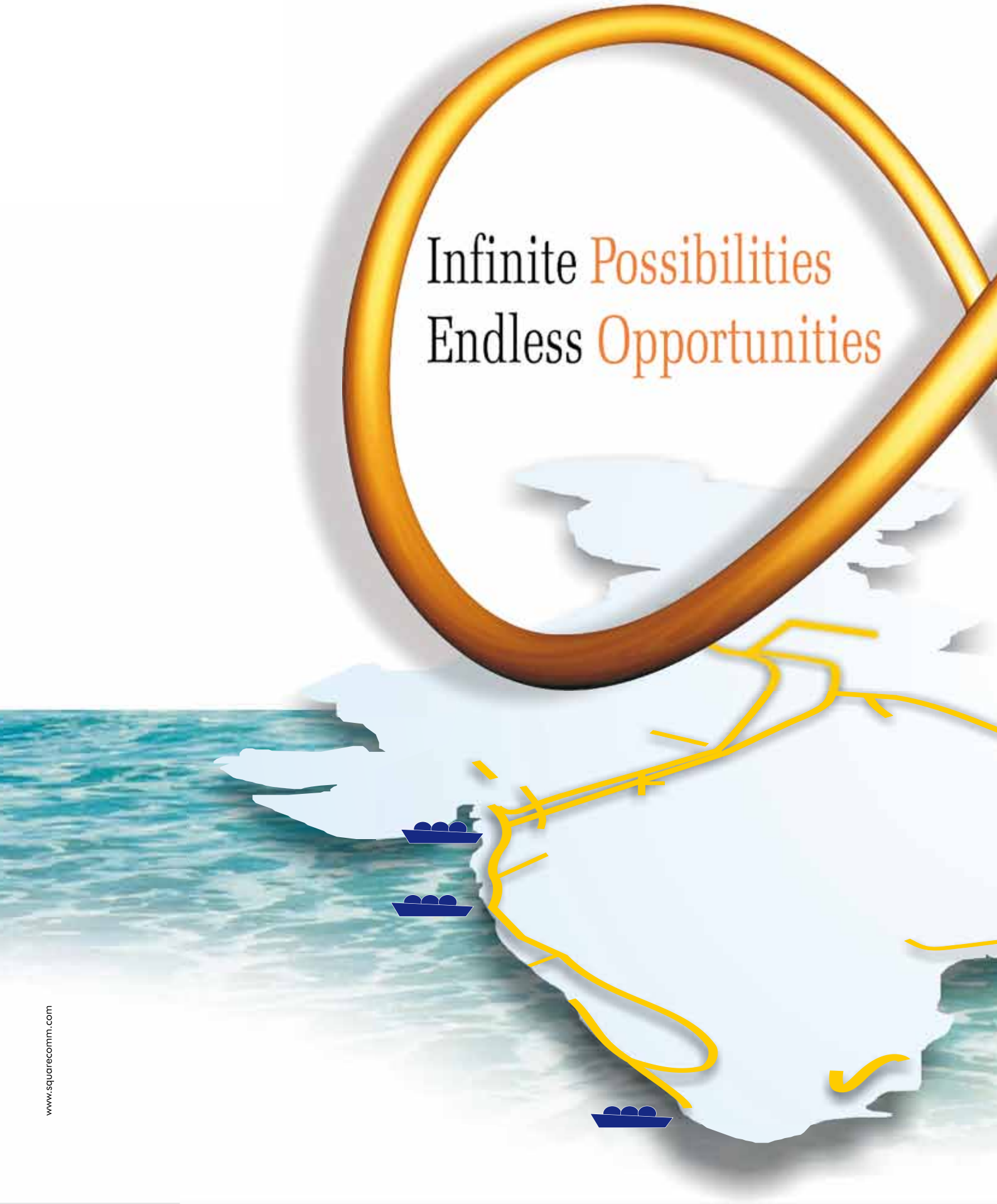

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Progress Reports from the Task Forces

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

Task Force 1 – Building Strategic Human Capital

The fourth meeting of TF 1 was held on March 15 in London, UK. It was hosted by National Grid at the Watermen and Lightermen Hall and was attended by 13 members. The meeting was preceded by a dinner on March 14, organised at the Swan Restaurant situated by Shakespeare's Globe Theatre, overlooking the River Thames. TF 1 members had a wonderful time and enjoyed the sumptuous dinner.

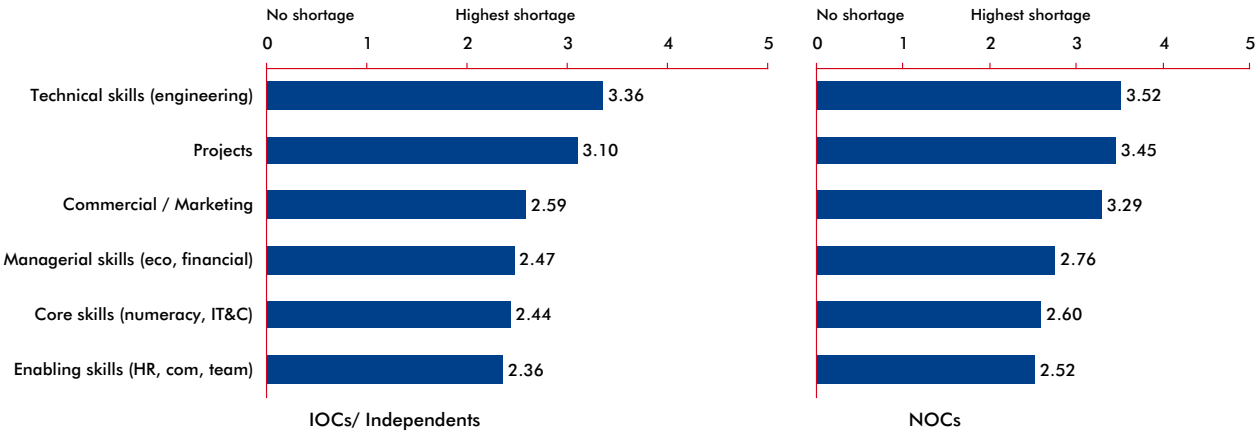
TF 1's Chair, Ieda Gomes opened the meeting and welcomed the first-time participants from PTT and Soh Mey Lee, the Chair of TF 2. Mey Lee described the activities of TF 2 and gave an update on an interactive website for young people (www.itsnotmagicitsscience.com), which has been developed by her Task Force to teach various science topics.

Following Mey Lee, Ungku Ainon, CC Secretary, briefed delegates on the recent activities of the Coordination Committee including the Call for Papers for WGC2012.

Next up was Marius Popescu of TF 1 who presented the detailed results of a demographic survey which aims to map out the key issues impacting human capital in the gas industry. The survey was distributed to around 600 companies in 2010. So far more than 80 companies have replied. Early results show, amongst other things, that gas companies suffer from a shortage in technical and projects skills, with NOCs suffering more than IOCs. Furthermore, gas companies do not expect the technical talent gap to reduce over the next 10 years (*see Figures 1 & 2*). The results also highlighted that while gas companies consider the career opportunities offered as a key selling point in recruiting and retaining talent, gas employees indicate the lack of career opportunities as the main reasons (second only to retirement) for leaving a company (*see Figures 3 & 4*). The complete results of the survey will be released at WGC2012.

ABOVE AND OPPOSITE TF 1's fourth meeting was held in London in March.

AVERAGE RANKINGS GIVEN FOR SHORTAGE OF SKILLS



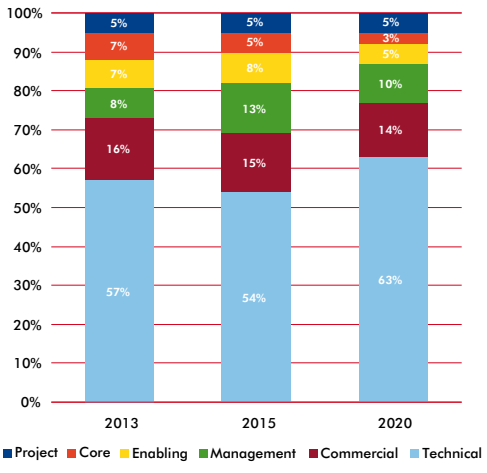
Note: Preliminary results only. Final results available at WGC2012.

Marius was followed by Jon Butterworth from National Grid, who offered an overview of the key themes emerging from the interviews conducted with industry experts by TF 1 so far. These interviews have identified a number of interesting ideas and patterns that are bound to shape the future of the gas industry. It is generally believed, for example, that the high cost of renewables still leaves a lot of scope for natural gas and that the extent to which gas features in the future energy mix out to 2050 will depend on the industry's capacity to decarbonise itself. Furthermore, with gas demand growing at a steady pace, the industry remains highly attractive to the financial community, offering security and a good return on investment. And, gas goes hand-in-hand with

ABOVE
Figure 1.

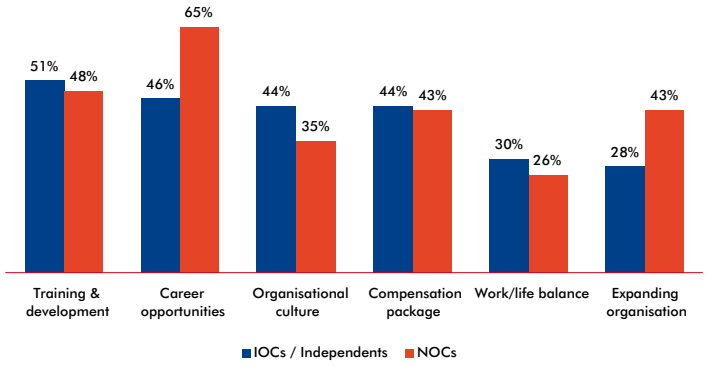
BELOW LEFT
Figure 2.

TOP SKILLS SHORTAGES EXPECTED BY GAS COMPANIES



Note: Preliminary results only. Final results available at WGC2012.

WHAT GAS COMPANIES SEE AS THEIR KEY SELLING POINTS IN RETAINING TALENT



Note: Preliminary results only. Final results available at WGC2012.

ABOVE
Figure 3.

renewables as investment in natural gas power generation capacity will be required to complement the intermittent character of renewables.

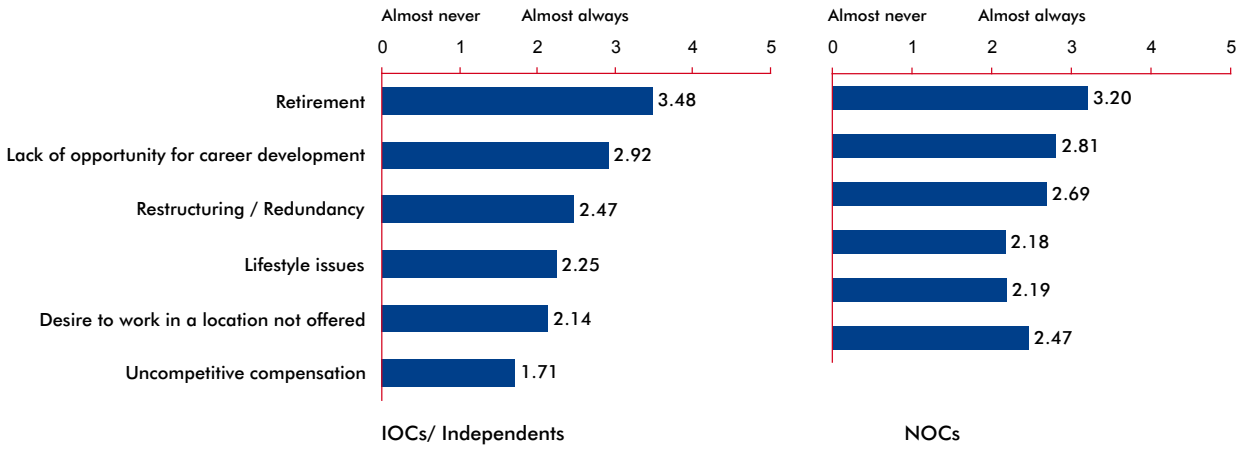
Then there was a presentation by Olivier Soupa of Schlumberger Business Consultancy (SBC) on the detailed survey that SBC is carrying out for TF 1. The objective of this second survey is to update and further detail the analysis of the issues already identified in the demographic survey and provide a more distributed and regional overview of the issues faced by the gas industry in terms of human resources. The detailed survey was launched in mid-April and is targeting approximately 200 companies from the entire gas value chain. The survey focuses on:

- The perspectives of the gas industry in terms of supply and demand of key staff and identifying the key deficit of talent in various segments of the integrated value chain;
- Recruitment challenges including ways to rebrand the gas industry as a dynamic and attractive place to work;
- Competency development requirements in the gas industry – best practices in training and competency development throughout the entire gas value chain; and
- Career management practices in the gas industry – the capacity of the gas industry to help staff adapt to a changing environment.

After lunch TF 1's Secretary, Manu Kohli presented the highlights of the first workshop held in Doha and the key themes that emerged. The workshop was very well attended with more than 80 participants. There were four speakers from the region with representation from Qatar, Saudi

BELOW
Figure 4.

AVERAGE RANKINGS GIVEN FOR REASONS PEOPLE LEAVE GAS COMPANIES



Note: Preliminary results only. Final results available at WGC2012.

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Arabia, Oman and Iran and five speakers from outside the region representing BG, the European Gas Research Group (GERG), China and Brazil.

The regional speakers highlighted the following points:

- Nationalisation of the workforce is a key strategy;
- Talent attraction and retention is a strategic priority to which senior management is committed;
- However, it remains challenging to recruit a quality workforce; and
- The gas industry has a poor image in the minds of young people.

Speakers from outside the Middle East highlighted:

- Changing profile of supply and demand dynamics;
- Challenges in recruiting for newer areas such as LNG and unconventional gas, combined with little or no growth in mature markets;
- A focus towards enhanced cooperation between industry and universities;
- The job for life culture in countries like China and the need to focus on corporate culture; and
- A nationwide programme in Brazil to fund scholarships.

Manu was followed by Daniel Paccoud from the French Gas Association (AFG), who shared a novel case study where AFG has associated with a technical institute to offer a Post-Masters Degree in Engineering & Management of Gas. The course has been offered since 1987 and is highly successful and well respected among professionals in the gas industry. Daniel also talked about the next meeting and workshop (*see box*) to be hosted by AFG.

Daniel's presentation was followed by discussions on the structure of the Triennium report and individual responsibilities for its various parts, led by Vice Chairman, Rod Kenyon. Rod is developing the skeleton of the report for discussion at the fifth meeting which at press time was due to be held in Paris on September 13.

THE SECOND TF 1 WORKSHOP

At presstime TF 1's second workshop was due to be held in Paris on September 13, sponsored by AFG, Oman LNG and Total. Entitled "Future Energy Mix – HR Challenges for Gas Companies in Europe and Asia", the workshop has been organised in three parts.

The first session will look at Europe with four panellists: René Rozot of GDF SUEZ, Marta Cydejko of PGNiG, Miguel Ángel Aller of Gas Natural Fenosa and Gerald Linke of E.ON Ruhrgas.

Then there will be a case study from the Netherlands presented by Geertje Dam of Student Media.

The third session will look at Asia with three panellists: Daisuke Ozaki of Osaka Gas, Taninpat Svetsreni of PTT Thailand and Nor'Aini Bt Jalaludin of Petronas.

A full report on the workshop will be included in the next progress report.

● Task Force 2 – Nurturing the Future Generations

The third meeting of TF 2 was held in Paris, France on March 16-17, graciously hosted by Vice Chair, Agnès Grimont from GDF SUEZ. The meeting was held at the headquarters of GDF SUEZ in the La Défense district.

A workshop was organised for team members to review the strategic recommendations of Deloitte Consulting. A comprehensive overview was presented by the Deloitte Consulting team on the key findings of the assessment of key trends and developments in 10 countries in STEM (science, technology, engineering and mathematics) education as part of the Task Force's project on "Nurturing the Future Generations".

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TF 2 members with Agnès Grimont of GDF SUEZ who hosted the third meeting. Marc Florette, Senior Vice President of Research & Innovation at GDF SUEZ and Georges Liens, Director of Strategy, Development & Regulatory Affairs at GDF SUEZ were also present.

TF 1 Chair, Ieda Gomes, Head of New Ventures, BP Gas, Asia & Middle East was invited to participate in the workshop. TF 2 team members included Heike Boss, Shell's Vice President of Human Resources based in Singapore, M. Saifunazim B. M. Jainal of Petronas Chemicals Group, Munira Salim of Petronas Research and Technology and Stefanie Khaw of Petronas Carigali Sdn Bhd. Also present was CC Secretary, Ungku Ainon Ungku Tahir.

At the workshop, it was discussed that both TF 1 and TF 2 will play crucial roles in integrating the link between nurturing the interest of young people in STEM education, subsequently attracting qualified STEM candidates with the right understanding and perception of the global gas industry to join the industry and then attracting and retaining them so that the industry will have a better chance of building strategic human capital.

The team members worked hard to rank and prioritise the strategic recommendations put forward by Deloitte Consulting before finally agreeing on several high impact strategies. Among the key recommendations was the need for the industry to address the female population as women tend to shun the oil and gas business due to the perception that the industry is male-dominated.

TF 1 Chair Ieda Gomes said during the workshop that different countries can develop very different trends with regard to human capital. For instance, she highlighted that one of TF 1's workshop findings was that "nationalisation" of the workforce especially in Middle Eastern countries also led to workforce expansion to create employment opportunities. This is different from countries such as the UK, which tend to move towards higher efficiency and productivity and hence a reduction in workforce numbers.

TF 2 focuses on introducing new approaches and strategies to nurture and attract the future generations while leveraging on ideas and best practices of companies and countries with regard to STEM education.

During the third meeting, the Task Force reviewed the progress of Youth Programmes for WGC2012, and agreed to build on

work done for the IGU Magazine and on the Strategy Study.

Also invited to present to the meeting was Marie-José Fourniguet of GDF SUEZ who is a member of the Technical Programme Committee of the IGU Research Conference 2011. She briefed participants on the preparations for IGRC 2011, and advised the Task Force to creatively engage and promote the Youth Programme events to ensure a bigger turnout at WGC2012.

One of TF 2's promotional activities is the E-essay competition for 18-30 year olds. Winners of this competition will be sponsored to attend WGC2012.

TF 2 Chair Soh Mey Lee also mentioned that the Task Force's Strategic Panel session will take the form of a Youth Roundtable – involving an on-stage engagement between selected youth candidates (top E-essay winners) and industry captains. Information on the competition is available from the TF 2 website www.itsnotmagicitsscience.com which has been up and running since April.

The website features subjects and content broadly related to STEM as well as to natural gas and its role in the global energy mix, environmental aspects and the like. It is also linked to the IGU website as well as other partners and sponsors such as the Malaysian Gas Association, WGC2012, Petronas, Shell, Petrosains, The Discovery Centre and the Technology, Entertainment and Design (TED) conferences.

Courtesy of TF 3 Chair, Mel Ydreos of Union Gas, Canada, the TF 2 youth website also posted two videos by Spectra Energy. TF 2 welcomes contributions for posting on the website from all IGU members such as articles on scientific and engineering matters, publications, write ups, illustrations, or even the sharing of work experiences with young people. Contributions from existing company documentary or video production relating to STEM education, the environment, or specific sectors of the gas industry will be most appreciated.

Around 250 participants are expected to attend the Youth Carnival and Conference at WGC2012. Some will be shortlisted from the submissions to the E-essay competition while others will be selected nominees sponsored to represent their respective companies, countries or gas associations.

Those selected to attend will be addressed by key speakers from the industry. The Task Force is in the midst of identifying and inviting industry leaders to share their invaluable experience with these young and energetic future leaders during WGC2012 and we hope to get full support from IGU members.

The third meeting ended with a technical visit to the Paris science museum (Cité des Sciences et de l'Industrie) where the Task Force was greeted by the Head of the International Affairs Department, Marie-Sophie Mugica. She shared her views on the current situation regarding young people's interest in science and commended IGU's efforts in nurturing the future generations.

● Task Force 3 – Geopolitics and Natural Gas

Significant effort has been dedicated to solicitation of sponsors for the work of the Task Force. We are pleased to report excellent progress on this front, with the following line-up of sponsors as of presstime:

- Royal Dutch Gas Association (KVGN), premium sponsor;
- Chevron, WGC2012 strategic panel sponsor;
- Gazprom Export, general sponsor;
- Eni S.p.A., general sponsor;
- CPC Corporation, Taiwan, partial regional roundtable sponsor;
- TAQA Arabia, regional roundtable co-sponsor;
- Oman LNG, regional roundtable co-sponsor; and
- IBP, regional roundtable sponsor.

We would like to formally thank those organisations that have committed to provide financial support for the work of the Task Force.

TF 3 most recently met in May in Milan, where members and guests were invited to tour the Teatro alla Scala Museum.

Since our last update, activity has been largely focused on organising a series of regional roundtable events to build understanding of regional geopolitics and how they impact gas market development.

At TF 3's Middle East roundtable IGU President Datuk Rahim Hashim greets HE Nasser bin Khamis Al Jashmi (Ministry of Oil & Gas, Sultanate of Oman – *far left*), Brian Buckley (Oman LNG – *second left*) and Khaled AbuBakr (TAQA Arabia – *right*).

The second of these roundtable events, looking at the Middle East and North Africa region, was held on April 19 in Muscat, Sultanate of Oman. It was generously co-hosted by Oman LNG and TAQA Arabia, with support from the project's general sponsors, the Royal Dutch Gas Association, Gazprom, Chevron and Eni. Attended by a wide cross-section of 25 senior people from the gas industry and academia, the roundtable was focused on developing a deeper understanding of regional geopolitical issues.

Our co-host, Oman LNG, began the event with an informal dinner on April 18. The roundtable was then convened on April 19 at the Grand Hyatt Muscat.

The discussion began with observations and dialogue related to a discussion paper developed for the workshop by Professor Bassam Fattouh, Director of the Oil & the Middle East Programme at the Oxford Institute for Energy Studies, who served as a subject matter expert for this event. Participants offered regional perspectives on Professor Fattouh's themes as well as key themes in the draft

TF 3 roundtable delegates pose for a group picture in Muscat.

report on Geopolitics and Natural Gas from the Clingendael International Energy Programme.

Please see Professor Fattouh's article below for a summary of some of the issues raised during the event.

Aside from the second roundtable, planning has been underway for two more invitation-only events. At presstime these roundtable sessions were due to be held as follows:

- South America, location: Rio de Janeiro, Brazil, August 22; and
- Europe-CIS, location: Amsterdam, The Netherlands, September 30.

TF 3 most recently met on May 12 in Milan, Italy. Attended by 10 Task Force members and six other guests, the meeting was largely focused on summarising themes from the two completed regional roundtables, and developing/reviewing plans for TF 3 sessions at the World Gas Conference in 2012.

Our hosts from Eni arranged for a private tour of the Teatro alla Scala Museum in Milan immediately following the meeting, which all members enjoyed immensely. Later in the evening Eni also hosted a gala dinner for all those present. On behalf of everyone attending we would like to thank our hosts at Eni for their generous hospitality and excellent company.

Task Force members have agreed that remaining roundtable planning can be best accomplished via email exchanges and telephone conferences. With this in mind a third formal meeting of the full Task Force will not be scheduled until early 2012.

● The Geopolitics of Natural Gas in the Middle East and North Africa

By Bassam Fattouh

In the 2000s, a new phenomenon began to appear in the MENA countries: shortages of gas leading to curtailment of exports and a need for imports in some countries. Some observers claim that MENA faces a "gas crisis", a situation which is difficult to reconcile with the region's massive natural gas reserve base which accounted for around 45% of global proven gas reserves in 2009.

One important dimension to the MENA natural gas puzzle relates to the rapid growth in domestic consumption due to improvements in income levels; a rapidly expanding population; a concerted policy of increasing the role of gas in power generation and water desalination; and a low pricing policy. Despite continuous efforts to reduce their dependency on hydrocarbon revenues, the energy sector still accounts for the bulk of export earnings and government receipts and acts as the main engine for economic growth in most MENA countries. High population growth rates, a young population age structure, and higher female participation in the labour force are putting pressure on MENA governments to diversify their economies to generate employment opportunities for the hundreds of thousands entering the labour market each year. Natural gas lies at the heart of these diversification efforts as it has become the fuel feedstock of choice for industrialisation through energy intensive industries.

Another important dimension is pricing policy. MENA has some of the cheapest domestic gas prices in the world. This has intensified the gas supply-demand gap by encouraging demand growth and limiting potential supply responses by reducing the incentive for exploration and development and investment in domestic gas infrastructure. Low prices have been important for domestic political stability while creating a significant stumbling block to greater regional trade.

Another important dimension is the geopolitical one. The region has been engulfed with international conflicts and regional disputes which over the years have reduced the region's ability to attract investment and transfer technology limiting MENA's supply and export potential. In countries such as Iran, these geopolitical factors have been manifested in the imposition of sanctions, which prevented investment flows and technology transfer and were therefore to some extent responsible for Iran becoming a net gas importer while sitting on the second biggest reserve base in the world. While most international sanctions imposed during the Saddam Hussein era have been lifted, Iraq currently faces a different set of challenges including a fragile political coalition, security concerns, a weak central government and regional tensions. Libya has also suffered from a long period of sanctions which prevented the country from exploiting its gas potential during the 1980s and 1990s. Sanctions were lifted in 2004 following Libya's rapprochement with the West, but these sanctions were re-imposed in February 2011 as fighting between the rebels and Muammar Gaddafi's forces intensified leading to a cessation of exports. Sanctions and the increasing likelihood of a prolonged civil war suggest that exploiting Libya's gas potential will not materialise any time soon. In the East Mediterranean, regional conflicts may prevent some countries from maximising the potential of recent gas discoveries as well as limiting the scope for regional gas trade.

Geopolitical events have also affected the direction of gas trade flows and efforts towards greater regional integration. MENA has long-standing political problems and border disputes. Suspicions and fears about Iran's hegemony in the region make many GCC countries reluctant to rely on its gas supplies. Poor political relations between Mashreq countries and Israel will likely limit the scope of future cooperation in gas trade, while security problems may prevent Iraqi gas from reaching that region to compensate for shortfalls in Egyptian deliveries partly caused by political upheavals in that country. In North Africa, political tensions remain the main stumbling block to a more meaningful penetration of natural gas in the energy mix in gas poor countries such as Morocco.

The interplay between rising demand, low pricing policy and geopolitics implies that the MENA region is unlikely to make a major contribution to future global gas trade, with the exception of Qatar and Algeria to a lesser extent. As such, MENA gas will not have the same geopolitical relevance as MENA oil. Historically, the security of

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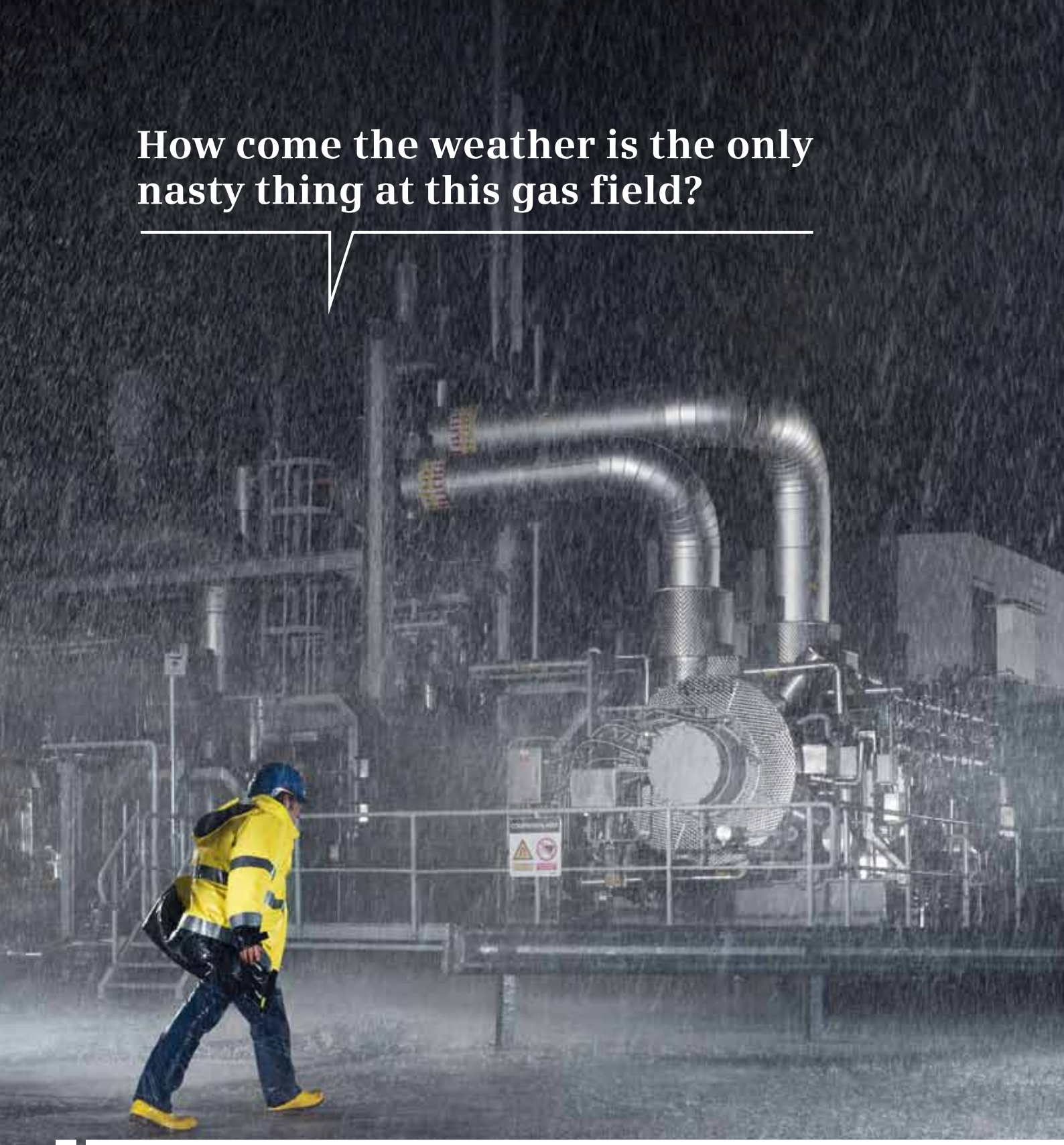
oil supplies from the region has played a major role in shaping international relations between the West and the Middle East and has been a central tenet in the West's energy and foreign policy towards the region. Natural gas will not assume a similar position as oil and is likely to play a secondary role in shaping the Middle East's relations with the rest of the world. Qatar remains a notable exception. By leveraging on its gas revenues, Qatar has gained influence out of proportion to its size and has been increasingly playing a leading role in the region's thorny political issues in Lebanon, Sudan and, most recently, Yemen and Libya. Qatar is also a founding member of the Gas Exporting Countries Forum (GECF) and hosts the secretariat.

Despite its limited role in the global gas scene, MENA should not be dragged out of the gas geopolitical map. Given the region's massive gas reserves and its geographic position, fundamental changes in the international and domestic scenes could prove to be key game changers in the global and regional gas outlook. Of these potential game changers, the following five stand out: firstly, an improvement of Iran's relations with the West and neighbouring countries enabling Iran to attract investment and technology; secondly, an improvement in Iraq's political situation allowing the country to develop its gas and oil reserves and integrate with the rest of the region; thirdly, the relaxation of the moratorium on gas development in Qatar after which a relatively rapid export increase could be achieved; fourthly, a comprehensive peace process between Israel and neighbouring economies leading to a rapid development of the new finds; and, finally, price reform and a more attractive local investment environment which would contribute to the rapid development of the region's reserves, slow down the growth in gas consumption and foster regional gas trade.

At the time of writing however, the enabling conditions for a structural transformation in the MENA gas scene are absent. Rather than improving, there is a strong possibility that relations between Iran and the international community could worsen. Iranian frustration with continuing sanctions and the failure to expand its gas exports significantly could lead to hostile Iranian actions aimed at destabilising gas developments in, and flows from, the region. Barack Obama's arrival in the White House has failed to make a breakthrough in the Arab-Israeli peace process and the new discoveries in the East Mediterranean may fall victim to border disputes, geopolitical tensions, and even armed conflicts. In Iraq, political instability remains the country's biggest threat in monetising its gas reserves. Competition over influence in Iraq could lead to further fragmentation of Iraq into regional power bases. Popular anger at a persistent lack of basic services and perceptions of pervasive corruption have eroded the legitimacy of the government, and any decision to export gas without fully meeting domestic demand is likely to be met by strong public opposition. In Qatar, the moratorium or "gas pause" is not due to be lifted until 2015, but even if lifted it seems unlikely that a nation with a population of around 1.4 million (many of whom are expatriates) will want to increase its exports substantially beyond current levels. Recent uprisings in the Arab world have made the prospect of price reform more remote. For both old and emerging political leaderships, the survival of the regime will be the main priority at least in the short to medium term and no government will want to deal with the destabilising political and social consequences of removing subsidies.

Professor Bassam Fattouh is the Director of the Oil & the Middle East Programme at the Oxford Institute for Energy Studies; Research Fellow at St Antony's College, Oxford University; and Professor of Finance and Management at the School of Oriental and African Studies, University of London.



Innovative compressor trains from Siemens boost production and preserve the environment.

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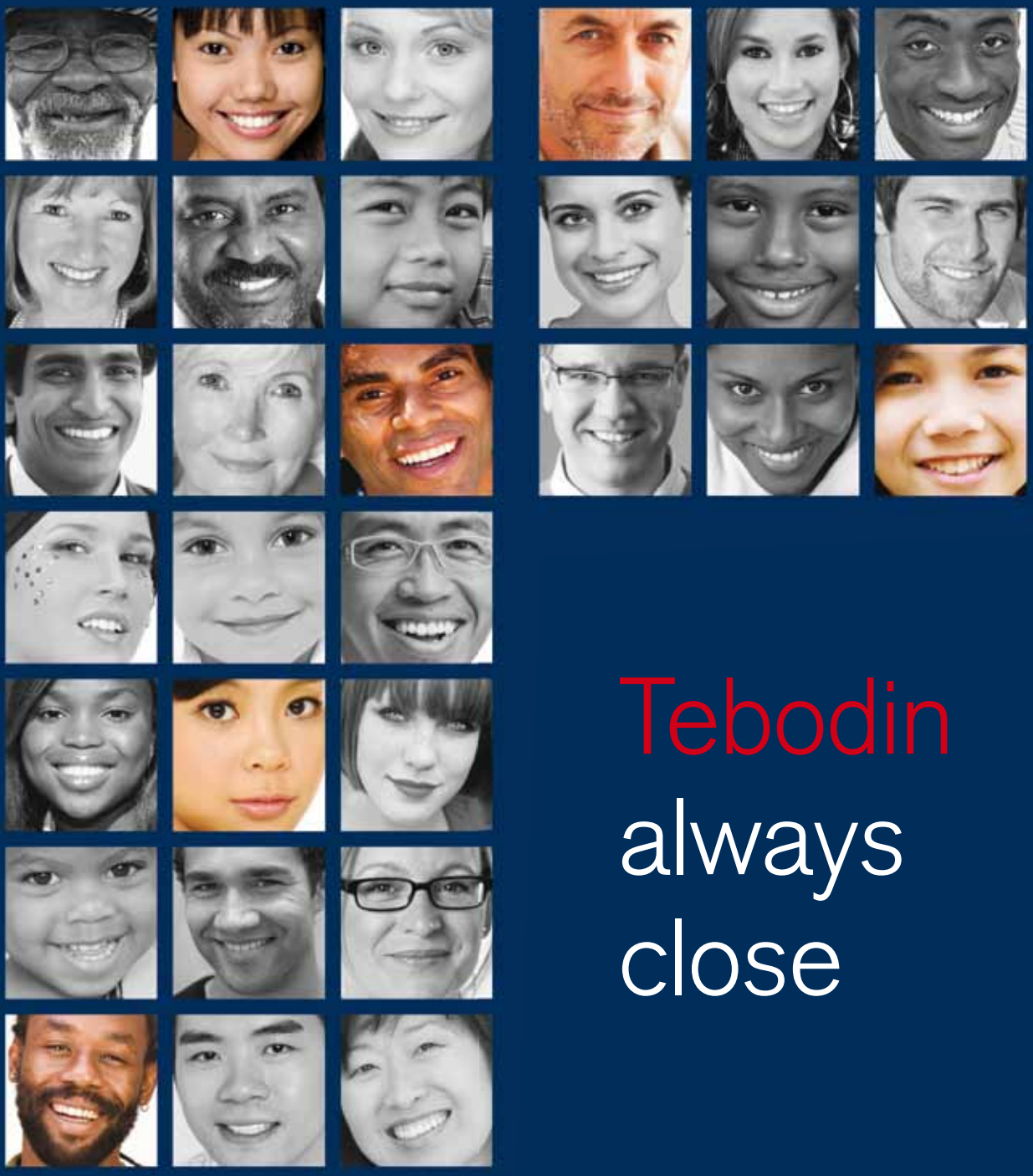

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FEATURES

This issue's features section starts with a profile of the gas industry in Croatia which is hosting the 2011 Council meeting. Then we have an article from the World Bank-led Global Gas Flaring Reduction partnership and one from WOC 2 on efforts to reduce emissions in UGS operations. Following these are a key international pipeline projects update and an article on best practices in pipeline integrity management from WOC 3.

Eight other Technical Committees and Task Forces have contributed to this issue. There are articles from WOC 1 on the world's UCG endowment, PGC C on the Asian gas market, PGC A on the impact on Japan's energy policy of the earthquake and tsunami in March, PGC B on the first ICER-IGU workshop, PGC E on a gas marketing summit, TF 1 on an initiative to attract students to the gas industry, TF 2 on its work in nurturing talent, which will culminate with a special youth programme at WGC2012, and WOC 4 on advanced metering in Japan. There is also an article on an unusual gas resource – the dissolved methane in Lake Kivu in central Africa.

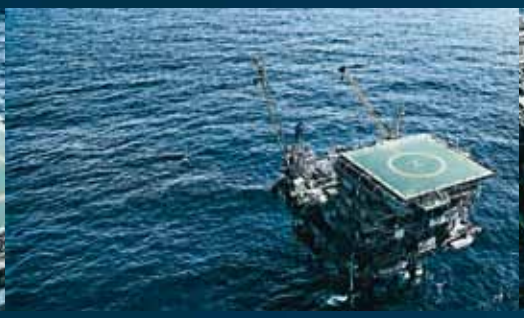
We round up with profiles of two of IGU's new Associate Members, a description of the publications and documents available from the Secretariat and the events calendar.

In order to get here, we followed the most rigorous safety rules



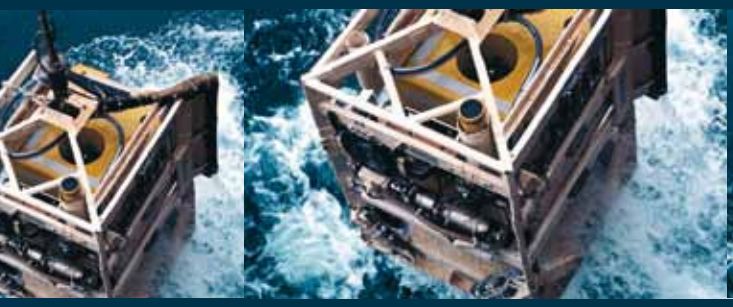
and the most revolutionary theories.











Throughout its history of over half a century, Petrobras has become one of the largest energy companies in the world. As a leader in exploration and production of oil in deep and ultra-deepwater, Petrobras is already producing in the area that

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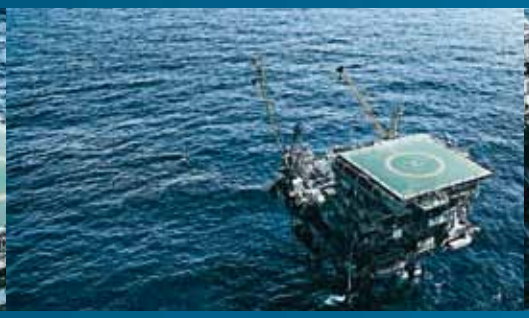
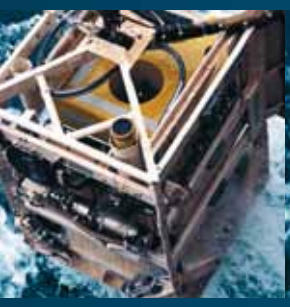
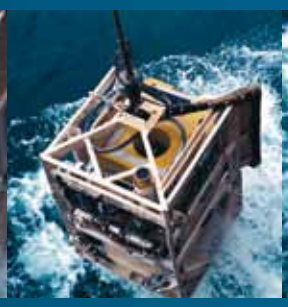







contains the largest oil accumulation ever found in Brazil: the offshore pre-salt layer. To confront this challenge, Petrobras will employ its usual strategy: research, technology, investments and safety. If the future is a challenge, Petrobras is ready for it.

PETROBRAS

CHALLENGE IS OUR ENERGY

The Croatian Gas Industry

By Josip Friščić

It is the Croatian Gas Association's special honour as the representative of the gas industry in the Republic of Croatia, to host the IGU Council Meeting, in Dubrovnik, October 3-7. This is the first time this prestigious gathering has been held in Croatia.

The Republic of Croatia, as an independent country, joined IGU in 1992 as an Associate Member, and has been a Charter Member since 1993.

The history of gas in Croatia

Gas produced from other fuels, such as coal and wood, started being used in Croatia in the mid-19th century. The country's first gas plant was built in Rijeka in 1852 and one opened in Zagreb in 1862. Gas produced in these plants was first used for public lighting, and later for other purposes.

The first natural gas reservoir in Croatia was discovered in 1918 by deep drilling in Bujavica, near Lipik. A small carbon black plant was built with production and industrial use of natural gas beginning in 1923. The gas reservoir was depleted by 1937, but in the meantime a new gas field in Gojlo had been discovered. Thanks to those reserves, a carbon black plant was built in Kutina in 1937 and in 1938 a lime plant was built along with a gas distribution network, providing gas for consumption. In 1941, a new gas field in Janja Lipa was discovered.

After World War II, associated natural gas production began when the Šumećani oil field was discovered in 1948, followed by the Kloštar oil and gas field in 1954. Meanwhile, a new Croatian petroleum exploration and production company called Naftaplin was established through the merger of several companies in 1952. The new company's efforts boosted Croatia's gas production from 6.5 mcm in 1952 to 18 mcm in 1955.

Construction of a 98km, 150mm-diameter gas pipeline from Janja Lipa to Zagreb began in

INA INDUSTRIJA NAFTE D.D.

Since it was founded in 1964, INA Industrija nafte d.d. has grown to become the largest company in Croatia, covering a range of activities in the oil and gas business including exploration and production, LPG production and refining and processing of petroleum derivatives in the Rijeka and Sisak oil refineries.

To support its activities, INA recruits experts from the University of Zagreb's Faculty of Mining, Geology & Petroleum Engineering, the Faculty of Chemical Engineering & Technology and the Faculty of Mechanical Engineering & Naval Architecture, as well as other universities in Croatia. The company also supports training and continuing professional education via placements in large global companies which use the most advanced oil and gas technology.

1954. With the completion of the first section of this pipeline from Ivanić Grad to Zagreb in December 1955, natural gas became available as a new energy source for residential, commercial and industrial customers in the Croatian capital.

The discovery of the Okoli gas-condensate field in 1963 was a turning point in the development of Croatia's natural gas industry. Significant discoveries of oil and gas fields in the Podravina and Slavonia regions, as well as the discovery of new oil fields, resulted in increased gas production and encouraged investment in construction of the gas transmission system and the connection of new gas consumers.

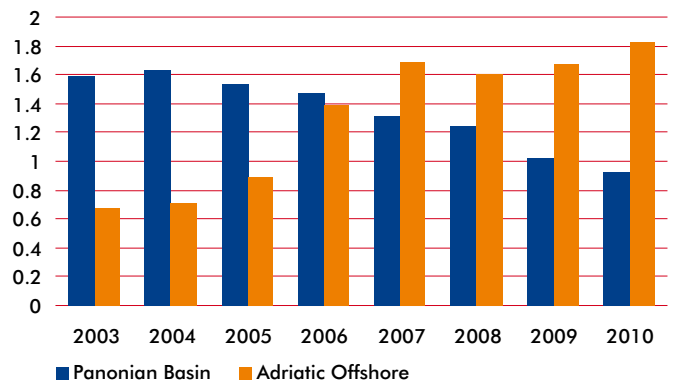
On January 1, 1964 Naftaplin linked up with the oil refineries in Rijeka and Sisak to form an oil and gas conglomerate which started trading as INA Industrija nafte Zagreb from January 1965.

Exploration continued and the largest gas field in Croatia was discovered at Molve in 1974.

Dubrovnik is the host city of the 2011 Council meeting.

The gas treatment plant at the onshore Molve field.

ONSHORE AND OFFSHORE GAS PRODUCTION 2003 TO 2010 (BCM)



ABOVE
Figure 1.

An LPG plant was built in Ivanić Grad and an ethylene plant in Zagreb.

In 1977, gas production and consumption in Croatia reached 1 bcm. The following year pipeline imports from the USSR began, allowing further expansion of the gas market and a rise in the number of consumers. The pipeline entered Croatia via Slovenia.

Remote control

Due to the significant increase in the country's gas production and the overall development of the gas industry, remote management of the gas pipeline transmission system was essential.

In 1979, a Temporary Gas Dispatch Centre was built in Zagreb by INA-Naftaplin. The centre received information on gas production, gas pressure, flow in the main gas nodes and off-take stations 24 hours a day via the existing radio-communications system and telephone network.

In 1983, Zagreb City Gas Utility, the largest gas distributor, was the first in the country to build and start operating its own dispatching centre. In the same year a new INA-Naftaplin dispatching centre was built in Zagreb.

Offshore developments

In the 1980s, offshore exploration efforts bore fruit with the discovery of the Ivana field in the northern Adriatic Sea. Ivana began production in 1993 (the year the Croatian Gas Association was founded) and further offshore fields were subsequently

The A and K platforms of the offshore Ivana gas field.

discovered. The most recent to begin production was Izabela in June and offshore production has made up for declining onshore production (see *Figure 1*).

Two companies are involved in the exploration and production of gas in the northern Adriatic, INAgip (a joint venture of INA and Eni Croatia) and ED-INA (a joint venture of INA and Edison International). The fields are linked to the Croatian mainland via a submarine pipeline making landfall at the city of Pula.

The gas industry today

Today, natural gas is produced from 16 onshore gas fields, 29 oil fields and nine offshore gas fields. In total, Croatia's indigenous production meets 65% of domestic consumption (see *Figure 2*). Over 605,000 households and 80,000 businesses are supplied with gas.

The country's natural gas transmission system is operated by Plinacro, which was set up as a separate company in 2001 in line with European moves to unbundle transmission infrastructure. The transmission system connects gas fields in the Pannonian Basin and northern Adriatic, underground gas storage facilities, 37 distribution systems and 27 eligible customers. At the end of 2010 it consisted of:

- A 2,360km network of main and regional pipelines with diameters ranging from 150 to 800mm and working pressure of 50 and 75 bar;
- More than 300 surface facilities (gas nodes, block valve stations, blow-out stations, cathodic protection); and
- 10 inlet metering stations and 162 gas supply or metering and reducing stations.

A National Dispatching Centre opened in 2006 and is fitted with a state-of-the-art supervision, control and data acquisition (SCADA) system. This is linked to the important process facilities in the transmission system through their telecommunication subsystems (microwave and radio links and fibre optic communication system) using remote stations.

GAS PRODUCTION AND CONSUMPTION 2010 (BCM)

Total consumption	**3.242**
To storage	0.071
Onshore production	0.923
Offshore production	1.804
Less production for export under INAgip production sharing agreement	0.483
Available for domestic consumption	2.244
Gas imports from Russia	1.045
Additional gas imports	0.024

Source: Energy Institute "Hrvoje Pozar", Zagreb.

LEFT
Figure 2.

As noted above, work on Croatia's high-pressure gas network began in 1954 and the final stage is the construction of a pipeline to southern Dalmatia. The section to Split is expected to be completed by the end of 2012 followed by a connection to southern Croatia in the future.

Construction of the main gas pipeline to Split is being carried out by Plinacro, while EVN of Austria acquired concessions in 2009 for the construction of the gas distribution system in the county of Šibenik-Knin and cities of Zadar and Split. EVN has set up EVN Croatia as its local subsidiary to invest $145 million in building a 1,450km distribution network.

New connections

To maintain stability of supply during this period of development when domestic gas production is not expected to increase, new gas connections are being developed.

Work began on a second international pipeline link via Hungary in 2010 and the first gas started to flow in August 2011. The Croatia-Hungary Gas Interconnector has a diameter of 800mm and a

The Báta compressor station in Hungary on the Croatia-Hungary Gas Interconnector.

maximum operating pressure of 75 bar. Annual capacity is 6.5 bcm with the capability of bidirectional flow. On the Croatian side the Slobodnica-Donji Miholjac and Donji-Miholjac-Dravaszerdahely pipelines have a total length of 80.5km, while the Dravaszerdahely-Bata-Városfold pipeline on the Hungarian side is 210km long.

In February, Plinacro signed a Memorandum of Understanding and Cooperation with Trans Adriatic Pipeline AG (TAP), which intends to construct a gas pipeline connecting Greece with Italy via Albania and the Adriatic Sea. Called the Southern Gas Corridor, the bidirectional pipeline will link gas producers in the Caspian region with Europe.

Plinacro also plans to enter new markets in southern Europe and is one of the initiators of the Ionian-Adriatic Gas Pipeline (IAP) project. This aims to achieve security of energy supply and economic prosperity for Croatia and the whole region.

In addition to the pipeline projects, Plinacro has proposed an LNG receiving terminal based on the migration concept. The idea is to start with a floating regasification vessel and then construct an onshore terminal on the island of Krk in the northern Adriatic. The LNG terminal will have a capacity of 4 bcm/year, with the possibility of increasing capacity to 16 bcm.

As the terminal is not likely to enter service before 2016 or 2017, Plinacro is considering hiring a floating LNG regasification terminal with an annual capacity of up to 2 bcm. By doing so, Croatia will be able to offer the use of its own gas transmission system to supply other countries.

This project along with others will be assigned to the European Commission's energy package, which opens the way for EU funding. The preparation of project documentation for the floating regasification terminal, connecting pipelines and the IAP will be financed with grants from European funds. Plinacro's preparatory

A fleet of 60 CNG-fuelled buses operates in Zagreb.

activities are underway, and the next stage is open for cooperation with partners.

LPG and CNG

Croatia's LPG production in 2010 was 305,600 tonnes of which just over half was consumed domestically. Government subsidies have been introduced to develop demand particularly on islands and other areas not reached by the natural gas transmission system. There are several specialised companies developing gas utilisation in coastal regions and in the hinterland regions of Croatia.

A significant number of installations have been built on the Croatian coast for various consumers using LPG. Thanks to gas heat pumps, gas is used for heating and cooling of residential premises, hotels and industry, from Istria in the north-west to Dubrovnik in the south-east.

On the CNG front, there are plans to build a number of refuelling stations, including a new one at the Zagreb-Dubrava bus terminal for Zagreb Municipal Transit System (ZET). The company has been running 60 buses on CNG for three years.

● Looking ahead

Croatia is working on a number of projects to make optimum use of its existing gas reserves and find new ones. Techniques to enhance gas recovery at existing fields and the development of marginal reserves and unconventional gas reserves are being evaluated. There are plans to explore for new gas reserves in the central and southern Adriatic region and in the Dinarides. There will also be further development of diversified gas supplies (e.g. via the Nabucco and South Stream pipelines). Along with this, the gas distribution system will be expanded to increase gas consumption and the number of consumers in the country.

Josip Friščić, Expert Assistant, Croatian Gas Association (www.hsup.hr).

POWER TO THE PEOPLE

GAZPROM

Reducing Gas Flaring Under the Clean Development Mechanism

By Francisco Sucre and Mauricio O. Ríos

Given the great potential for reducing greenhouse gas emissions (GHG) from gas flaring projects, why are so few gas flaring projects in the Kyoto Protocol's Clean Development Mechanism (CDM) pipeline?

This question – and the answer to it – has been the focus of attention of a network of various oil and gas stakeholders over the past two years.

Led by the World Bank's Global Gas Flaring Reduction (GGFR) partnership, these stakeholders have formed a technical and collaborative platform aiming to contribute to emission trading schemes as a way of scaling up efforts to recover flare gas and reduce emissions in the oil and gas industry. This platform later became known as GGFR's Carbon Finance Network (*see box*).

The network's main intention has been to leverage the technical and practical expertise of relevant oil and gas industry players so practical suggestions to CDM methodologies accepted by the United Nations Framework Convention on Climate Change (UNFCCC) can be presented. Progress has already been made in terms of understanding the barriers and issues that need to be tackled to improve the applicability of the methodologies and increase the number of gas flaring reduction projects in the CDM pipeline.

Now, more concrete steps and actions need to be taken to unlock the potential for more gas flaring reduction projects to benefit from carbon credits through the CDM, thus becoming economically viable to implement.

Why gas flaring matters

Total emissions from gas flaring account for some 400 million tonnes per year and represent about 1.2% of global CO_2 emissions. These emissions from flaring can be effectively reduced through targeted incentives, such as carbon finance, and the right mix of policies and regulations.

To put these numbers in perspective, consider the following:

Emissions from gas flaring represent about 1.2% of global CO_2 emissions.

- Emissions from global flaring are roughly equivalent to the annual emissions from 77 million cars;
- Emissions from flaring in Nigeria alone represent about one third of the country's total CO_2 emissions, according to Nigeria's National Communication to the UNFCCC;
- Global emissions from gas flaring alone are close to the total GHG emissions from countries such as Mexico or Australia, and more than half the annual Certified Emissions Reductions (624 million tonnes) currently issued under the Kyoto Clean Development Mechanisms (data as of June 2011); and
- In most large oil and gas companies, flaring represents one of the largest sources of GHG emissions.

Although some important progress on flaring reduction has been achieved over the past few years as per the latest satellite estimates, it is evident that much more needs to be done to have a larger impact in terms of improving energy efficiency and reducing GHG emissions from flaring.

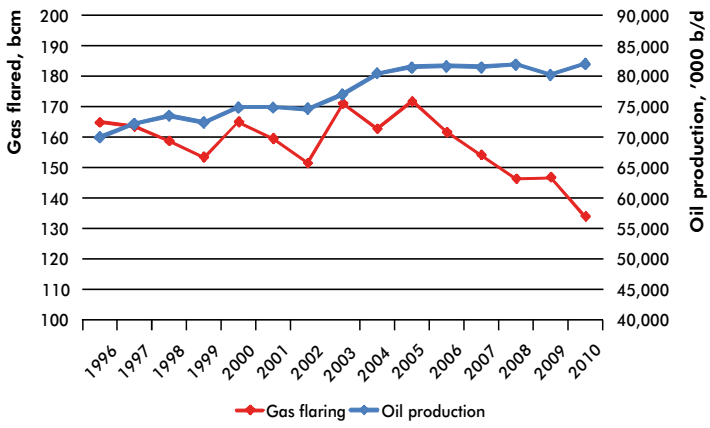
Some 134 bcm of associated gas was still flared worldwide in 2010, an amount equivalent to almost 30% of the European Union's annual natural gas consumption. Overall, the flaring of gas adds about 360 million tonnes of CO_2 in annual emissions. Some flaring also emits black carbon, or soot.

Satellite estimates produced by the US National Oceanic and Atmospheric Administration (NOAA) show that for the fifth consecutive year, flaring of gas associated with oil production has dropped worldwide. Between 2005 and 2010, gas flaring decreased by 22% from 172 to 134 bcm, with the biggest annual decline between 2009 and 2010 (*see Figure 1*). The satellite study was commissioned by the GGFR partnership.

The 13 bcm decline in flared gas in 2010 occurred despite a two million barrel-per-day increase in crude oil production over the same period. This also confirms a 15% drop in gas flaring intensity (ratio of gas flared to oil production volumes) since 2002.

Overall, Russia and Nigeria have seen the largest reductions but still top the list of flaring countries in 2010, which also includes Algeria, Angola, Iran, Iraq, Kazakhstan, Libya, Saudi Arabia and Venezuela.

GLOBAL GAS FLARING FROM SATELLITE DATA



ABOVE
Figure 1.

Background on GGFR's Carbon Finance Network

Following on from a CDM methodology workshop held in Amsterdam in December 2008, the GGFR partnership started a process to explore

GGFR CARBON FINANCE NETWORK MEMBERS

Chevron	Total
ConocoPhillips	Wärtsilä
ENI	Carbon Limits
ExxonMobil	G3 Baxi
Marathon Oil	Energy Redefined
Masdar (UAE)	GGFR/World Bank
Qatar Petroleum	US EPA Global Methane Initiative
Shell	UNEP Risø Centre
Statoil	

GAS FLARING REDUCTION PROJECTS IN THE CDM

			Applicability					
	CDM Approved Methodology	**Sub-type**	**Sources of gas that can be recovered**	**Infrastructure investments**	**End-uses of recovered gas**	**Registered**	**Total Active**	**Credits issued**
Natural Gas Flare Reduction	AM0009 version 04	Oil field flaring reduction	Gas from oil wells (including gas lift gas)	Pipelines, compressors, processing plant, utilities	Energy purposes (combusted), existing market/ users	10	32	2
	AM0037 version 02.1	Oil and gas processing flaring	AG from oil well (not including gas lift gas)	Pipelines, treatment, potentially a new facility	Production of useful product (feedstock)	2	6	0
	AM0055 version 01	Oil and gas processing flaring	Waste gas (any)	Pipelines, treatment, utilities	On-site energy	0	1	0
	AM0074 version 01	Oil field flaring reduction	Permeate gas from membrane processing of natural gas	Pipelines, treatment, compressors, utilities	New gas-fired power plant	0	1	0
	AM0077 version 01	Oil field flaring reduction	AG from oil well (including gas lift gas, without procedures)	Pipelines, compressors, CNG related infrastructure	Delivery of CNG only for heat gen. at specific end-users	0	0	0

Note: Information is taken from www.cdmpipeline.org and figure produced by GGFR.

ABOVE
Figure 2.

whether concerted efforts should and could be made to prepare methodologies for successful CDM project development in the oil and gas industry.

The main motivation behind this was the minor impact the CDM has had on GHG gas emissions from the oil and gas industry, partly caused by the lack of suitable methodologies approved by the UNFCCC CDM Executive Board. It was evident that oil and gas industry investments were radically underrepresented in the CDM, with just a handful of projects in a pipeline of more than 5,000 (see *Figure* 2).

Back in 2009, GGFR engaged Carbon Limits, a consulting firm, to coordinate a consultative process and explore whether an independent workgroup or network should or could be established to facilitate the successful development and registration of CDM projects from the oil and gas industry.

Carbon Limits also did an assessment of the barriers to successful development of oil and gas CDM projects and the merits of concerted actions by a network to overcome such barriers.

This consultative process, backed by the GGFR partnership, showed that there was support among oil and gas industry players, project developers and other stakeholders, including the United Nations Environment Programme (UNEP) and the US Environmental Protection Agency's (EPA) Global Methane Initiative, to establish a workgroup or network.

And so a network of stakeholders was born under the leadership of the GGFR partnership, which was identified as the most suitable platform to lead and coordinate the carbon finance network's efforts.

The consultative process with stakeholders was a vital component of this work and formed the basis for the recommendations presented to all stakeholders and the UNFCCC. Below are some of the highlights of the barrier analysis, including the challenges and opportunities ahead.

Barriers to applying CDM to flare reduction

Some of the main results from the barrier analysis showed that:

- Narrow applicability of CDM methodologies has contributed to so few oil and gas projects successfully reaching the CDM validation and registration levels.
- Existing methodologies relevant for flare reduction projects have inconsistencies and gaps with respect to coverage of sources of gas, flare recovery methods, infrastructure requirements and applicable end-uses.
- Terminology is used inconsistently and interpreted differently in alternative flare reduction methodologies. This creates unnecessary problems and uncertainties during the CDM approval processes.
- Approved methodologies have limited guidance on appropriate ways to monitor emissions reductions. This deficiency is a major reason behind problems with verification and issuance of carbon credits for flare reduction projects.
- There are major problems in the communication between UNFCCC institutions and oil and gas project developers.

Huge potential for positive results

The barrier analysis focused on associated gas flare reduction project opportunities and relevant CDM methodologies. This was the project category within the oil and gas industry with most projects in the CDM pipeline, since flare reduction projects offer large, real and measureable emission reductions. Significant short-term results can be achieved within this project category.

It should be noted, however, that other project categories such as reduction of methane emissions from oil and gas infrastructure and reduction of process venting of CO_2 represent even larger emission reductions opportunities than flaring. These project categories are largely untested under the CDM, and hence might also be a natural target for concerted efforts under the Carbon Finance Network.

In fact, the network will consider expanding its activities to focus on other important abatement opportunities (e.g. methane emissions and CO_2 venting) in the petroleum sector where additional incentives provided by the UNFCCC mechanisms – or other emission trading schemes – could foster significant GHG emission reductions.

Based on the barrier analysis and through further consultation with the stakeholders, the network's first outputs so far include:

- *Technical specifications* for expanding the applicability of approved flare reduction CDM methodologies;

A woman cooks tapiocas by a flare in Nigeria.

- An oil and gas *CDM Glossary of Terms* to make sure all stakeholders use consistent terminology for these projects and to facilitate work on project validation and verification; and
- Oil and gas *CDM Monitoring Guidelines* to appropriately monitor emission reductions, and improve verification and issuance of carbon credits for flare reduction projects.

How it all happened

The consulting team conducted an assessment and assembled a list of project cases that demonstrated the difficulties encountered by project participants (developers, investors, etc.) through the application of existing oil and gas sector CDM baseline and monitoring methodologies. The most important of these methodologies, as discussed with members of the network, were AM0009, AM0037, AM0055 and AM0077 (these are different variations of flare recovery methodologies initially formulated by various project developers).

The consulting team also prepared a questionnaire for the participants of the network, with the aim of gathering detailed information about the problems faced when trying to apply these CDM methodologies to flaring reduction projects.

It became clear, from the onset, that there were a large number of issues and problems with the development of CDM flare reduction projects. In fact, some 38 topics were initially identified as potential barriers or problems.

However, it was not cost effective to simultaneously address all these 38 topics or issues that needed improvement in the existing methodologies through the formal process mandated by the UN, which requires the submittal of a formal request for revision by presenting a new detailed technical revised version of the existing Approved Methodology (i.e. AM0009, AM0037, or AM0077) to the UNFCCC.

So, after further analysis by the consultant and network members, the issues were narrowed down to 20 as potential topics for a request for revision by the UNFCCC Methodology Panel, the body in charge of reviewing and advising the Executive Board.

These 20 topics were also subjected to a deeper review and evaluation for further refinement and combination (when possible) based on the consultants' recommendations and additional discussions within the network.

Conclusions

The main results of these comprehensive reviews and assessments were presented in technical workshops held in 2010 and 2011 between the network members and the UNFCCC Secretariat.

The network has made available tools like the glossary of terms and monitoring guidelines to all project developers and stakeholders interested in implementing CDM flare reduction projects.

The last activity that the network will undertake is to submit a request for revision, incorporating all recommended amendments and accompanying it with a sample flare gas recovery project to demonstrate how these modifications are applied in real cases.

The network members expect, through these initial efforts, to foster the successful development and registration of more CDM flare reduction projects.

As a future step, the network will consider engaging in other carbon offsetting GHG abatement opportunities such as reducing methane releases and CO_2 venting, where additional potential emission trading approaches like benchmarking and sectoral baselines could further contribute to significantly reducing GHG emissions from the oil and gas sector.

Francisco J. Sucre is a Senior Energy Specialist with the World Bank's Oil, Gas and Mining unit and the Global Gas Flaring Reduction partnership. Mauricio O. Ríos is a Communications Officer with the Oil, Gas and Mining unit and GGFR (www.worldbank.org/ggfr).

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Efforts to Reduce Methane Emissions in UGS Operations

By Pierre Marion and Hélène Giouse

As one of its study topics for the 2009-2012 Triennium, IGU's Working Committee 2 decided to look at the methane emissions of underground gas storage (UGS) operations and efforts to minimise them. The project is the responsibility of Study Group 2.2 dedicated to "Best Practices".

We would like to thank all the members of WOC 2 for the help they gave us by providing information about their company policies on the subject.

Background

Today, all major companies have a Quality, Health, Safety and Environmental (QHSE) policy. One of its major goals is to prevent pollution and reduce the environmental impact of the company's activities in order to contribute to the battle against global warming and protect natural resources. This includes the reduction of greenhouse gas emissions.

Getting ready to commission an encapsulated compressor at a storage facility.

Among the greenhouse gases, methane is recognised by the Intergovernmental Panel on Climate Change (IPCC) as having a global warming power 21 to 23 times higher than that of CO_2.

Even though gas storage operations do not make a major contribution to methane emissions, gas companies with storage operations do have programmes to reduce methane emissions. The aim of the study is to present the current situation and the main trends.

Questionnaire

Precise data are difficult to obtain for technical reasons, as shown by some previous studies (e.g. Marcogaz study, Jürgen Vorgang, WGC2009). To obtain some data about the subject, Study Group 2.2 sent a questionnaire to all members of WOC 2. Three simple questions were asked:

- Are there regulations in your country about methane emissions? If not, are there demands from the authorities linked to the issuing of the permit for operation?
- Please rank the sources of emissions with percentages. The sources considered are compressors (sealing leak and start/stop venting), venting for servicing part of the UGS facilities and well servicing (including well testing). Other sources not considered are emergency shutdown venting and diffuse emissions.
- Best practices: for each of the three sources mentioned above, to indicate the techniques used or planned to be used for reducing methane emissions.

We received a dozen answers mainly from European Union and CIS countries. These answers to the three topics can be summarised as follows:

- Three countries reported having methane emission regulations (Germany, Russia and the UK).
- The three sources were ranked: 1. compressor; 2. venting part of facilities for servicing; and 3. well servicing, including testing.

- Best practices are mainly related to two techniques:
  – control of compressor seal emissions by either a gathering system for re-injecting in pipes or the installation of an encapsulated compressor; and
  – recovery of gas during planned venting, including well testing, by re-injection in pipes.

Other data sources

The other main source of data is an environmental report that all major companies in the oil and gas business publish each year as part of their annual report, especially those that are registered to the ISO 14001 standard.

From these sources (three environmental reports from European Union and CIS companies) we have been able to calculate an average ratio of methane emissions compared to working gas volume: approximately 500 $m^3(n)$ per million $m^3(n)$ of working gas, i.e. 0.05%.

This looks to be a reduction from previous years. If we compare with the report from SG 8.1 of WOC 8 "Environment, Safety and Health" published at WGC2000, the average emission factor was estimated to be 0.1% of the working gas volume (0.05% at the lowest and 0.7% at the maximum).

The reports of integrated gas companies also show that the emission of methane from UGS operation represents around 5% of the gas industry's total emissions.

Conclusion

Even if UGS is a very low methane emitting activity, efforts have been made in recent years to decrease emissions. It can be noted that:

- Emerging technology in the last decade, such as electrically driven encapsulated compressors, will help to achieve zero emissions for some UGS activity; and
- More and more UGS operators are reducing the venting of natural gas during maintenance.

These efforts have mainly been voluntary since regulations in the field of methane emissions are not yet broadly implemented.

Pierre Marion is a member of Working Committee 2 – Storage and Hélène Giouse is the Committee's Chair. Both work for Storengy (a GDF SUEZ company).

Companies with gas storage operations are taking steps to minimise methane emissions – this is Storengy's Gournay-sur-Aronde facility.

Nord Stream Broadens Europe's Gas Supply

By Matthias Warnig, Managing Director of Nord Stream AG.

From the effects of the recent events in Libya and Japan, to the financial crisis, the global energy landscape is constantly changing, influencing both energy demand and supply flows globally. Energy policy needs to adapt if it is to continue to provide citizens with long-term sources of energy supply, and the development of new infrastructure projects is crucial in this dynamic landscape. Increased awareness to combat greenhouse emissions and climate change also continues to play a key role in shaping energy policies globally and at EU level.

This is the context in which European energy security of supply should be examined. European energy policy ranks security of supply as one of its most important goals, alongside CO_2 emission reduction objectives and European competitiveness. The promotion of energy infrastructure projects that ensure long-term reliable energy supplies is therefore a vital tool in achieving the EU's energy aims, particularly for gas supply.

Bridging the supply gap with gas

Europe's long-term energy mix is rightfully being considered in the context of security of supply, and here too the role of natural gas is important. As Europe looks to develop further renewable energy supplies, gas pipelines can act as a foundation on which to build tomorrow's energy capacity. Natural gas is a versatile fuel that can bridge the supply gap caused by intermittent renewable energy supply much more easily than other fossil fuels or nuclear power. In addition, natural gas generation today has an efficiency of 60%, compared to 45% for modern coal power plants, with 50% lower CO_2 emissions. Therefore, policy makers across the EU, along with non-governmental organisations, such as Greenpeace, have recognised the important role that gas will play in achieving Europe's ambitious CO_2 emissions reduction targets.

A project of European significance

The Nord Stream pipeline system has been considered a European priority project under the EU's TEN-E guidelines since 2006. The Nord Stream system – comprised of two, 1,224 kilometre pipelines that run parallel through the Baltic Sea – will bring 55 bcm of gas a year to Europe. That is enough to supply 26 million European households.

Bringing Russian gas to Europe

Nord Stream will transport gas directly from Russia, home to some of the world's largest gas reserves, to those European countries where demand is growing most quickly: Germany, the United Kingdom, Denmark, the Netherlands, Belgium, France and the Czech Republic, with supply also reaching other Member States of the EU. As Europe's domestic gas supply depletes, Nord Stream will fill a crucial gap in the market, while also providing an additional supply route to increase security of supply and ensure long-term access to Russian reserves for European consumers.

European-Russian partnership benefits both parties

Nord Stream is also a significant step forward in the strategic EU-Russia partnership. Russia has been a reliable energy supplier to Europe for 40 years, and the construction of a new transport route will build on that relationship to secure additional supplies for Europe when they are most needed. It is often forgotten, though, that Russia needs reliable customers for its gas as much as Europe requires long-term supply security. And whilst other sources of gas are available, unconventional gas is unproven in Europe and may be prohibitively difficult and expensive to extract on a densely populated continent, whereas LNG is flexible but is easily diverted to other countries or regions that are prepared to pay higher prices. In contrast, the certainty of pipeline delivery and the resulting European-Russian interdependence benefits both parties.

Construction progresses on schedule

The construction of the Nord Stream pipeline is well under way. The first of two parallel pipelines was laid at the beginning of May 2011. It was laid in three sections, which will be connected underwater. Following successful pressure testing, the first connection was completed at the end of May, and the final connection will take place in June. Construction of the second line began on schedule in May.

Financing for the Nord Stream project is secured

Despite the current situation in the financial markets, which has made accessing capital for many major infrastructure projects difficult, Nord Stream has successfully completed its financing, demonstrating the confidence the markets have in the economic soundness of the project.

Linking Consumers with Suppliers

I firmly believe that the EU's energy security goals will only be achieved by projects that enable long-term access to natural resources. Russia will remain Europe's main partner due to its vast natural gas reserves and Europe's growing gas consumption, combined with the potential for gas to contribute to CO_2 emission reduction targets. By building a new connection to natural gas reserves, Nord Stream is an integral part of this effort, bringing consumers and suppliers closer together.

Nord Stream
The new gas supply route for Europe

Respect.
For Europe's energy needs.

Europe needs new sources of natural gas to maintain economic growth while meeting climate protection targets. The Nord Stream Pipeline is a timely and environmentally sound means of bringing large volumes of natural gas to Europe. Nord Stream will provide enough energy to satisfy the energy demand of more than 26 million households. **www.nord-stream.com**

International Pipeline Update: China, EU, India and Pakistan

By David Hayes

China's plans to achieve long-term energy supply security took an important step forward in June with the opening of the eastern section of the Second West-East Gas Pipeline. European Union countries are moving ahead with new international gas pipeline projects and so are India and Pakistan. They all need to meet increasing energy demand in the face of insufficient local resources.

While LNG imports will help meet increasing gas demand in many of these countries, pipeline gas will play the biggest role. This article examines the progress of major international pipeline schemes intended to increase supplies to some of the world's fast growing gas import markets.

EU countries are longstanding importers of pipeline gas from Algeria and Russia. Supplies have now expanded with the commissioning of the Medgaz pipeline to transport gas from Algeria to Spain and will soon be bolstered by the commissioning of the first of the two Nord Stream pipelines delivering gas from Russia.

In 2014, additional piped Algerian gas supplies are due to enter the European market through the Galsi submarine pipeline project which has received a positive environmental impact assessment in Italy.

Plans to import gas from Central Asia and the Caucasus have also received a boost with positive developments reported on the Nabucco and South Stream pipeline projects.

The huge reserves in Central Asia are a focus of attention for China, India and Pakistan

China has inaugurated the Second West-East Gas Pipeline as part of its plans to achieve long-term energy supply security.

as well. The region offers an important new source of gas with a number of countries able to off-take supplies along the lengthy pipe-line routes.

Medgaz

Algeria's first direct submarine gas link to Spain was commissioned in May this year to carry gas from the Hassi R'Mel field. This gas is then fed into the Spanish grid through Enagás's Almeria-Albacete pipeline. Built at a cost of €900 million with an initial capacity of 8 bcm, the 210km, 24-inch diameter pipeline runs from Beni Saf on the Algerian coast to the Spanish port of Almeria.

The pipeline was laid across the Mediterranean floor in water up to 2,160m deep during 2008 by a consortium of Castoro Sei and Saipem 700 of Saipem, an Eni subsidiary.

In June, Algeria's state energy firm, Sonatrach, announced the company would sell a 10% stake in Medgaz to Spain's Gas Natural as part of a settlement of a long-running legal row over how much Gas Natural pays for Algerian gas imports.

Sonatrach's Medgaz shareholding will fall to 26% following the sale to Gas Natural. Other Medgaz shareholders are Cepsa (20%), Iberdrola (20%), Endesa (12%) and GDF SUEZ (12%).

Under the same deal, Gas Natural has agreed to pay $1.897 billion to Sonatrach and the Algerian firm will acquire a minority stake in Gas Natural.

Nord Stream

Swiss-based Nord Stream AG, owner of the twin-pipeline Nord Stream project to transport Russian gas to Germany, has announced the first pipeline will be opened in the fourth quarter of 2011, a slight delay from the original target of a first quarter 2011 opening date.

Running under the Baltic Sea from Vyborg in Russia to Greifswald in Germany, the Nord Stream scheme consists of two 48-inch pipelines, each totalling 1,224km in length, which will provide a

EU countries are moving ahead with new international gas pipeline projects such as Nabucco.

The first Nord Stream pipeline is due to open later this year.

combined 55 bcm/year transmission capacity when in full operation.

According to Nord Stream AG, construction has been completed on 420km, about one third, of the second pipeline already. The company plans to commission the second pipeline in the fourth quarter of 2012.

The project owners are Gazprom (with 51%), BASF/Wintershall (20%), E.ON Ruhrgas (20%) and Nederlandse Gasunie (9%).

Galsi

Delayed plans to build the world's deepest submarine gas pipeline to transport gas from Algeria to Italy are now poised to move ahead. This follows Galsi's announcement in March that Italy's Ministry of Environment and Ministry of Heritage and Culture have issued a Decree on the Environmental Impact Assessment (EIA) for the Italian section of the pipeline.

With the lengthy EIA stage now completed after the process started in July 2008, Galsi expects the Ministry of Economic Development will issue the required construction and operation permit so the project can move ahead. The permit delays have pushed the opening date back from mid-2012 to 2014.

The Galsi pipeline is backed by an international consortium that includes Sonatrach, Edison, Enel, Hera Group and the Region of Sardinia through its financial arm, SFIRS.

Snam Rete Gas, Italy's biggest gas distributor, signed an agreement with Galsi in November 2007 to build, own and operate the Italian section of the pipeline.

Measuring 837km in total and designed to transport 8 bcm/year, 552km of the Galsi pipeline will be constructed offshore at depths of up to 2,800m. The pipeline will begin at Koudiet Draouche, near Annaba, on the Algerian coast where it will connect with a pipeline supplying gas from the Hassi R'Mel field.

The first subsea section will be a 26-inch diameter, 285km pipeline crossing the Mediterranean, which will make landfall at Porto Botte in Sardinia. From there, a 48-inch diameter section will run 272km north to Olbia. Then there will be a 280km, 32-inch submarine section to Piombino on the Italian mainland where Algerian gas will be fed into the Italian gas grid.

South Stream

The ambitious South Stream pipeline project is still in the preparatory stage as Russia continues to negotiate bilateral treaties with potential partner governments along the route. This project aims to transport gas from Russia across the Black Sea to Bulgaria, avoiding Turkey, and then on to Greece and Italy through one branch, and to Austria and north-western Europe via a second branch line. A financial decision on the project is due to be made in 2012.

Gazprom and Eni signed a joint venture agreement in 2007 setting up a company to start marketing the project and conduct technical feasibility

Trans Adriatic Pipeline

Opening the Southern Gas Corridor

Enhancing Europe's Energy Supply

The Trans Adriatic Pipeline (TAP) supports the European Union's strategic goal of securing future gas supply. TAP offers a practical and realistic solution to the transportation of gas to Southern and Central Europe by opening up the Southern Gas Corridor.

The 520 km long pipeline will start in Greece near Thessaloniki, cross Albania and the Adriatic Sea and come ashore in Italy near Brindisi, allowing gas to flow directly from the Caspian region to European markets.

TAP connects to existing gas networks and is as a result, the shortest route in the Southern Gas Corridor.

The advantages of TAP for Europe include:

- Realistic and commercially viable
- Expandable gas transportation capacity (from 10 to 20 bcm per annum)
- Physical reverse flow of up to 8 bcm
- Underground gas storage facility in Albania

For more information, please visit our website:

www.trans-adriatic-pipeline.com

Trans Adriatic Pipeline (TAP) AG
Lindenstrasse 2, 6340 Baar, Switzerland, tel. + 41 41 747 3400, fax: + 41 41 747 3401
Enquiries@tap-ag.com

studies. The joint venture, South Stream AG, which both companies own equally, was registered in Switzerland in January 2008.

South Stream has the same design capacity as the Nabucco pipeline of 31 bcm/year and is viewed by some observers as a direct competitor. However, its joint venture partners maintain there is room for both pipeline schemes to proceed.

The South Stream route runs from Beregovaya on the Russian Black Sea 900km to landfall at Varna on the Bulgarian coast. The routing of the pipeline across the Continental shelves of Ukraine and Romania will require government permission from both to proceed.

From Varna, one branch line will run south to Greece and then cross the Ionian Sea to southern Italy and feed into the Italian gas grid. The branch line could potentially be connected to the planned Turkey-Greece-Italy pipeline.

The proposal also calls for a second pipeline branch to cross Serbia, Hungary and Austria, terminating at Baumgarten. A connection with the Haidach gas storage facility is also being discussed.

Other suggested routes include one crossing Slovenia to northern Italy and for pipelines to be constructed through Bosnia and Herzegovina to Ploče in Croatia, across the country to Rijeka and then onwards to Trieste in Italy.

In March, the Russian and Slovenian governments signed an agreement for the pipeline to cross Slovenia making a route crossing Slovenia more likely to be incorporated into the final South Stream plan.

Nabucco

The legal framework for the Nabucco pipeline was finalised on June 8, improving the prospects of gas reserves around the Caspian Sea finding markets in Europe. Project Support Agreements (PSAs) are now in place between Nabucco Gas Pipeline International GmbH and the responsible ministries of the five transit countries – Austria, Bulgaria, Hungary, Romania and Turkey. Nabucco's shareholders are Botaş, Bulgarian Energy Holding, MOL, OMV, RWE and Transgaz.

The Intergovernmental Agreement and the PSAs are necessary prerequisites for the successful financing of the project. Meanwhile, negotiations with potential gas suppliers are underway. These include Azerbaijan, Turkmenistan and Kazakhstan. Egypt, Iran and Iraq are other potential suppliers for the future.

Expected to transport 31 bcm/year, the 56-inch diameter, 3,300km Nabucco pipeline is planned to run from Turkey's eastern border, probably with Georgia, to Austria. The route runs 2,000km across Turkey, passing Istanbul, and then travels through Bulgaria (400km), Romania (460km), Hungary (390km) and Austria (46km) where it will terminate at Baumgarten.

The plans call for pipeline sections from Ankara to Austria to be built first while existing pipelines from either the Turkish-Georgian border or Turkish-Iranian border will transport gas to Ankara feeding into the first pipeline stage. This strategy will provide 8 bcm/year capacity initially while a new pipeline is constructed from Turkey's eastern border to connect with the first section at Ankara.

China

While Nabucco continues to negotiate with gas reserve owners in Central Asia and the Caucasus, China has taken action. On June 30, the 4,978km eastern section of the Second West-East Gas Pipeline was officially opened. It transports gas from Turkmenistan to the Yangtze River Delta region including Shanghai, Jiangsu and Zhejiang provinces, the Bohai Bay region and the Pearl River Delta region in Guangdong Province.

Built by China National Petroleum Corporation (CNPC), the opening of the eastern section of the Second West-East Pipeline follows earlier completion of the 3,726km western section which begins at China's border with Kazakhstan. Gas


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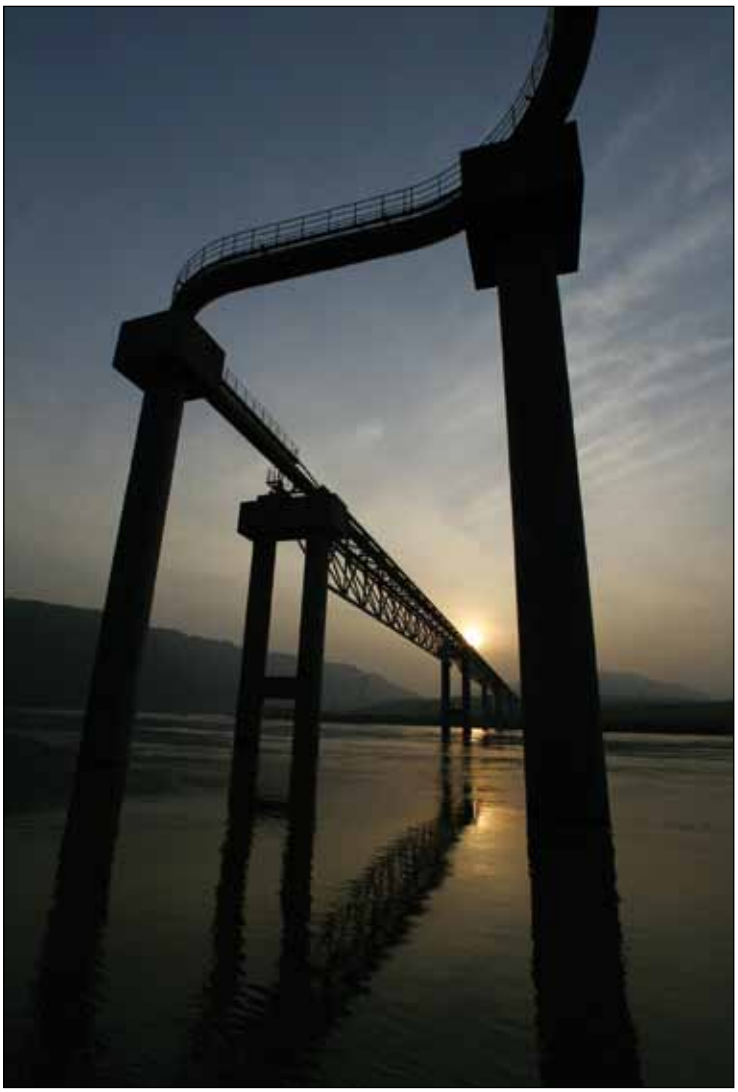


China's first West-East gas pipeline is running above design capacity.

from Turkmenistan to China is transported through the 1,830km Trans-Asian Gas Pipeline which crosses Uzbekistan and Kazakhstan and was officially opened in December 2009.

A new contract signed by CNPC and Turkmengaz in June 2009 replaced the original sales contract for 30 bcm/year that was signed in 2007. As a result, China will import 40 bcm annually from Turkmenistan. Built to carry 30 bcm/year, the Second West-East Pipeline's capacity can potentially be upgraded to carry the additional 10 bcm/year that CNPC has contracted to import from Turkmenistan.

CNPC also signed a production sharing contract in 2007 to develop gas fields on the right bank of Turkmenistan's Amu Darya River. These reserves will eventually provide about 13 bcm annually for the Trans-Asian pipeline while the rest of the gas will be produced from Turkmengaz-operated fields on the left bank of the Amu Darya River.

According to CNPC, the Second West-East Pipeline was built by a workforce of 50,000 with a total investment of $22 billion. Measuring 8,704km in length, it includes eight branch lines to supply cities en route.

The pipeline begins in Xinjiang Province in western China and passes through 15 provinces and regions from Xinjiang's Horgos to Nanchang, eastern China, where the pipeline forks. From here, one section continues to Shanghai on the east coast, while the other section runs south to Guangzhou and Hong Kong.

The Xinjiang-Shanghai section of the Second West-East Pipeline has been built along a parallel route to the original West-East gas pipeline commissioned in 2004. Built to carry domestic gas from fields in Xinjiang Province to Shanghai and the fast developing east coast region, the first West-East pipeline was designed to carry 12 bcm/year but has been transporting 17 bcm/year to meet demand.

Not surprisingly, the Second West-East Pipeline has further developed China's pipeline construction capability. According to CNPC, all X80 steel pipe used in construction was made in China with centralised purchasing saving $1.7 billion in costs.

Turkmenistan will become China's main source of gas imports once supplies reach their full contractual level, exceeding countries supplying China with LNG.

Meanwhile, China has either completed or started other major pipelines during the past 18 months. These pipelines are part of plans to increase the natural gas share of overall energy

use and reduce urban airborne pollution. In addition to supplying gas from the Second West-East Pipeline to new markets, pipelines have been built to develop indigenous gas production in Xinjiang Province and to the east coast gas grid. This includes interconnecting LNG terminals that are being constructed along the eastern and southern coast lines.

In Shandong Province, work was due for completion early this year on a 1,067km pipeline to carry gas from central Shandong to the province's east coast cities Qingdao and Weihai. Expected to cost about $1.4 billion to build, the pipeline is designed to carry 11 bcm/year of domestically produced gas or imported gas from Turkmenistan. Construction started on this project in 2009.

New pipelines are planned for the Yunnan Province in south-west China with an expected capacity of 4.1 bcm/year. The gas is due to begin arriving from neighbouring Myanmar in 2013 when China's second piped gas import scheme is commissioned. The new pipelines will carry imported gas to the provincial capital, Kunming, and feed into the existing transmission grid.

India and Pakistan

Last December in Ashgabat, Turkmenistan, plans to build the long-mooted Turkmenistan-Afghanistan-Pakistan-India (TAPI) gas pipeline were approved by the four countries' leaders. This project will create new markets for Turkmenistan's gas exports and help meet Pakistan and India's growing energy needs. It has also put back indefinitely Iran's plans to export gas to Pakistan and India via the proposed IPI pipeline.

The TAPI pipeline scheme involves construction of a 1,680km transmission line to transport gas from Turkmenistan's new South Yolotan-Osman field. The route travels south from Turkmenistan and then heads east through Herat and Kandahar in Afghanistan before crossing central Pakistan and entering northern India.

The four leaders also signed a framework document which envisions three bilateral meetings between Turkmenistan and each of the three other participating states to agree supply conditions including gas prices and transit tariffs. Another four-way meeting is planned to sign all sale and purchase agreements together.

The pipeline is planned to carry 33 bcm/year from Turkmenistan of which Pakistan and India will each receive 14 bcm while Afghanistan will receive 5 bcm. The Asian Development Bank (ADB) intends to fund one third of TAPI's estimated cost – this should provide banks and other funding agencies with the confidence to support the project. The ADB says it has factored security issues into its risk assessment.

At this stage, the plan is to complete the pipeline in 2014 and for service entry the following year, although the volatile security situation in Afghanistan could change this. India's projected demand for gas imports could justify constructing a parallel pipeline later if the initial gas transmission scheme proves successful.

David Hayes is freelance journalist writing on energy and business in the Asia-Pacific region.

In December 2010, plans to build the TAPI gas pipeline were approved by the four countries' leaders.

IndianOil: The Energy of India

"Natural Gas has garnered a major position in the energy basket and has evolved as the primary source of energy. In times to come, the future of the Hydrocarbon Sector will continue to be highly dynamic, challenging and competitive" says Mr R S Butola, IndianOil's chairman.

IndianOil is India's flagship national oil company with business interests straddling the entire hydrocarbon value chain – from refining, pipeline transportation and marketing of petroleum products to exploration and production of crude oil and gas, marketing of natural gas and petrochemicals. IndianOil is the leading Indian corporation in the Fortune 'Global 500' list, ranked 98th in 2011. With over 34,000 employees, IndianOil has been helping to meet India's energy demands for over half a century. With a corporate vision to be the "Energy of India", IndianOil closed the year 2010-11 with revenue of $68,837 million and profits of $1,719 million.

At IndianOil, operations are strategically structured along business verticals – Refineries, Pipelines, Marketing, R&D and Business Development – E&P, Petrochemicals and Natural Gas. To achieve the next level of growth, IndianOil is currently forging ahead on a well laid-out road map through vertical integration – upstream into oil and gas E&P and downstream into petrochemicals – and diversification into natural gas marketing and alternative energy, besides globalisation of its downstream operations. Having set up subsidiaries in Sri Lanka, Mauritius and the UAE, IndianOil is simultaneously scouting for new business opportunities in the energy markets of Asia and Africa.

Reach and Network

IndianOil and its subsidiaries account for over 48% petroleum products market share, 34.8% refining capacity and 71% downstream sector pipelines capacity in India. The IndianOil Group of companies owns and operates 10 of India's 20 Refineries with a combined refining capacity of 65.7 MMTPA. IndianOil's cross-country network of crude oil and product pipelines, spanning 10,899 km with a capacity of 75.26 MMTPA, is the largest in the country.

Investment

With a steady aim of maintaining its position as a market leader and providing the best quality products and services, IndianOil is currently investing Rs. 47,000 crore (Rs. 470 billion) in a range of projects for enlargement of refining and pipeline capacities, LNG import terminal development, expansion of marketing infrastructure and product quality improvement.

Redefining the horizon

Over the years, natural gas has emerged as the 'fuel of choice' across the world. Natural gas marketing is a thrust area for IndianOil with special focus on city gas distribution (CGD) and gas transportation. The corporation has entered into franchise agreements with other players to market CNG through its retail outlets.

During 2010-11, gas sales grew by an impressive 20.7% to 2.3 million tonnes from 1.91 million tonnes in the previous year. IndianOil is setting up a 5 MMTPA LNG import, storage and regasification terminal at Ennore. This terminal will be first of its kind on the east coast of India. Green Gas Ltd, IndianOil's joint venture with GAIL (India) Ltd, is already operational in Agra and Lucknow in the state of Uttar Pradesh and is further expanding to cater to increased demand in various sectors. Furthermore, in a consortium with GSPC, HPCL and BPCL, IndianOil has won gas pipeline bids for Mallavaram to Bhilwara and Vijaypur via Bhopal, Mehsana to Bhatinda and Bhatinda to Jammu and Srinagar.

IndianOil has the capabilities to supply regasified LNG to customers presently located in the northern and western regions of India. The "LNG at Doorstep" initiative involves making LNG available to customers not connected by gas pipeline. Gas is transported through a cryogenic system, stored in a cryogenic holding tank at the target location and regasified on site through vaporisers for use as a fuel.

Green Energy for a Greener Future

Gas is more than just an option for over a billion people in India. It is a source of clean and green energy that promises to transform... and help build a sustainable economy.

Driving this need is IndianOil... through Gas supplies to large Industrial Customers, Gas based power plants and Refineries.

IndianOil also provides customised gas solutions to customers who cannot access gas pipelines through its innovative 'LNG at Doorstep' facility. With new gas infrastructure like the LNG terminal at Ennore and City Gas Distribution networks in select markets, IndianOil is committed to Total Fuel Solutions to Households, Transport Systems & Industries.

Building a Greener Energy future for India.

इंडियनऑयल

IndianOil

Best Practices in Pipeline Integrity Management – The Experiences of Petronas

By Mohd Nazmi bin Mohd Ali Napiah

An effective management system is vital for a company to manage its assets and resources and deliver business objectives to the board, staff, stakeholders, investors and public. Petronas Gas Berhad (PGB), a subsidiary of Petronas, was accredited with the ISO 9001:2000 standard for its quality management system in 1995. Since then, PGB has maintained and continuously improved its management system in order to deliver business objectives.

PGB's management system operates at all levels of the company to standardise business practices throughout the organisation. System tools are available to assist management and staff to carry out business activities. As depicted in *Figure 1*, PGB uses a "pyramid" concept for its document management system.

Thanks to its integrity management system, Petronas Gas Berhad has a near-perfect pipeline reliability rating.

At the highest level, there are specific manuals that explain the overall process of PGB's business and how the interests of stakeholders, regulators and the public are met. PGB makes health, safety and environmental management a top priority with a dedicated manual for those business elements.

The Business Operating Manual (BOM) and Health, Safety, Environmental Management System (HSEMS) Manual are used by all divisions and departments as the reference documents to establish handbooks, procedures and work instructions to suit the needs of each business unit.

PGB's Operating System Manual (OSM) and Reliability and Integrity Management System (RIMS) Manual are the master documents to manage the operation, maintenance and integrity of its gas transmission system.

These two manuals are supported by procedures and instructions that guide PGB staff in executing day-to-day business processes and activities. These documents are stored as a controlled electronic copy in a document management system called e-BOS (electronic Business Operations System). The documents can be amended, reviewed and approved electronically. This is prudent and cost-effective – paper use is minimal and it saves time.

Apart from e-BOS, other software used on a daily basis at PGB includes:

- The Business Performance Tracking System (BPTS) which enables management to track and view company, division and department performance according to the key performance indicators (KPIs);
- The Electronic Corrective and Preventive Action Management System (e-CPAMS) which enables management and staff to upload and view reports following investigations of accidents

and/or operational incidents so lessons can be learnt. It also has the capability to track and update follow-up actions after a system integrity, HSE, financial or similar audit has been performed;

- The Electronic Management of Change (e-MOC) system which enables PGB's management to review, endorse and track approved changes such as new designs, upgrading and process changes to the pipeline system; and
- The Pipeline Risk and Integrity Management System (PRIMS) which assists PGB's staff in managing the integrity of the pipeline system.

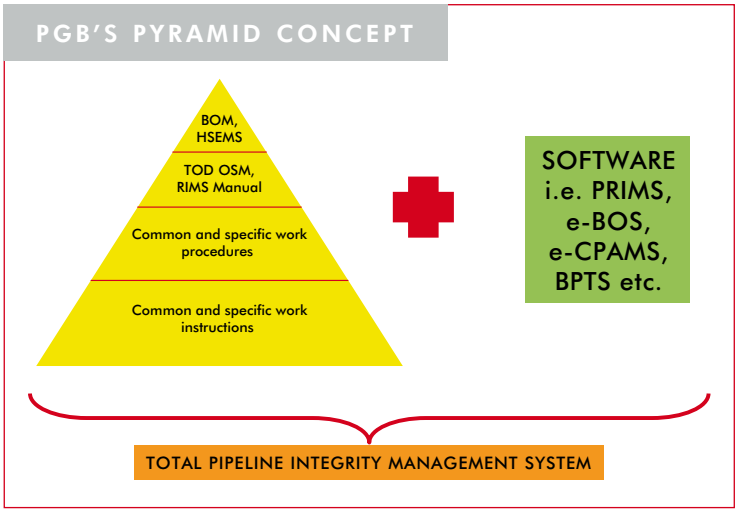
At the management level, there are key committees that strategise, drive and monitor PGB's business. The company also has a specific committee to monitor and drive key reliability and integrity initiatives. The Reliability and Integrity Management Steering Committee ensures PGB sustains and delivers superior business results operationally and financially.

Pipeline integrity management framework

PGB continues to look into improving the overall management process of its pipeline system integrity. Having studied US standards for managing pipeline system integrity (ASME B31.8S and API 1160), PGB has streamlined its management system according to these principles. There are five main elements of the pipeline integrity management framework:

- Integrity management;
- Performance measurement;
- Management of change;
- Communications; and
- Quality control.

Each element plays its own important role in the overall pipeline integrity management system. The elements are not totally new since the existing management system also addressed the above five elements in different ways.

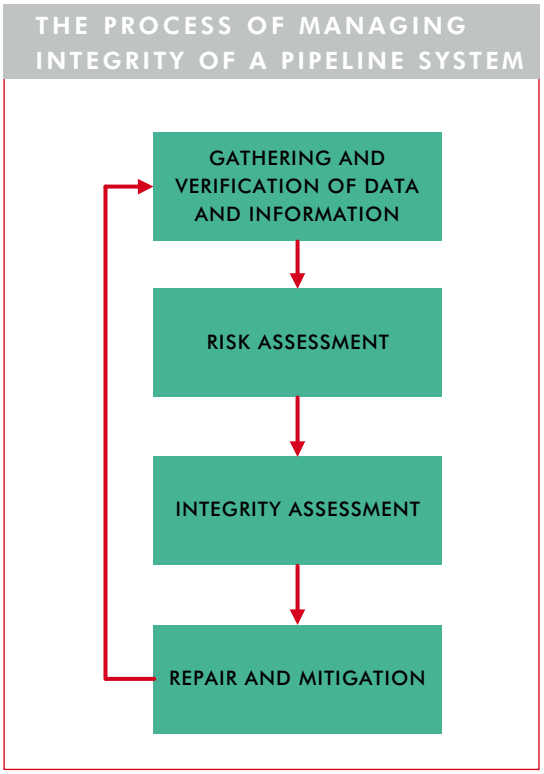


ABOVE
Figure 1.

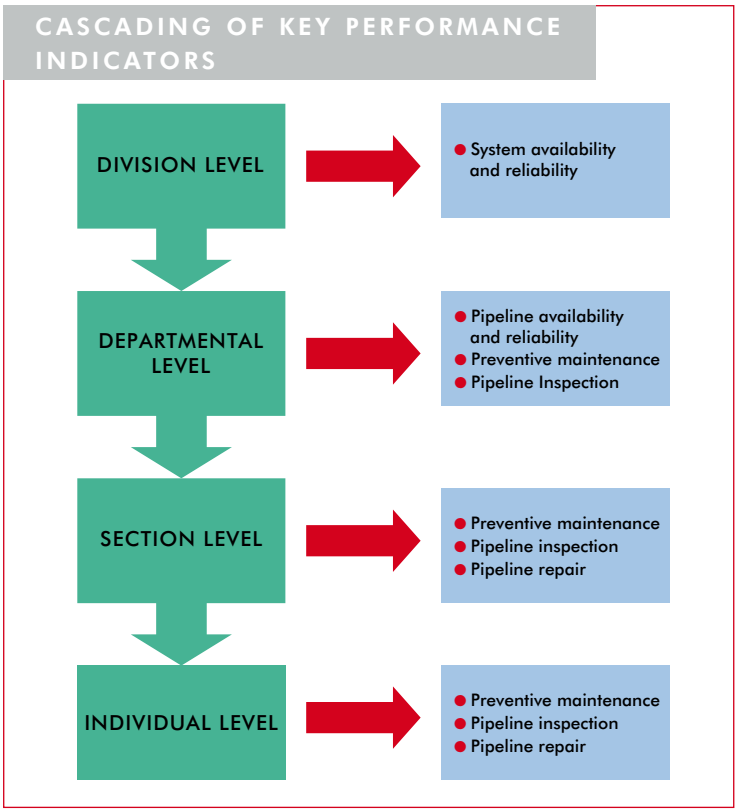
Integrity management

Integrity management addresses the effective management of assets such as the pipeline system (*see Figure 2*).

The process starts with the gathering of basic pipeline data and information on construction,



LEFT
Figure 2.



ABOVE
Figure 3.

testing, incident history, inspection, maintenance and repair. This information and data is verified and updated by operations, reliability, engineering and safety personnel to keep it current. The information and data is stored in a "live" electronic database for easy access and amendment. PGB uses the PRIMS software to store the pipeline information and data.

This information is used to perform a risk assessment for a particular pipeline section. Prior to that, typical pipeline threats are identified and these include:

- External and internal corrosion;
- Stress corrosion cracking (SCC);
- Third-party intrusion;
- Operator incompetence; and
- Geological issues i.e. flooding, soil erosion, soil settlement etc.

Among methodologies used by pipeline operators are: (i) qualitative risk assessment, (ii) semi-quantitative risk assessment and (iii) quantitative risk assessment. PGB has chosen the semi-quantitative method since it blends qualitative and quantitative assessment techniques and is proven to be effective. The risks of pipeline failure due to the above threats need to be calculated. Further action, such as integrity assessment, then needs to be conducted to ascertain the extent of the threats that could damage the pipeline.

Methodologies used to ascertain the integrity of a pipeline include: (i) in-line inspection, (ii) direct assessment, (iii) hydrostatic testing and (iv) any other proven methods or technology. PGB uses methods (i) and (ii) for its piggable and un-piggable pipelines respectively.

Further to in-line inspection and/or direct assessment, PGB uses current methodologies prescribed by codes, standards and best industry practices such as RSTRENG, ASME B31.8S, API 1160 and those detailed in the Pipeline Defect Assessment Manual (which was developed by oil and gas companies as a joint industry project) to assess pipeline defects and determine the appropriate action to repair them. In addition, PGB determines the re-inspection interval using the deterministic method prescribed by ASME B31.8S and API 1160.

The whole process is repeated should any information change from the current status. As mentioned above, an integrated software tool such as PRIMS is used by staff to execute the integrity management processes.

Performance measurement

PGB's performance measurement system helps staff at all levels to realise the company's objectives. Performance measurement is cascaded down from top management to the individual working level (*see Figure 3*) using leading and lagging performance indicators.

Senior managers usually use the lagging KPIs (results-based KPIs attained by looking back on past performance) and individual workers, such

as engineers, technicians and operators, usually use the leading KPIs (efforts-based, forward-looking KPIs).

The performance measurement system's main purpose is to translate the company's objectives into those of the division, department and individual. Another principle is to establish clear links between company and individual KPIs so that individuals are fully aware that their efforts are important and directly affect the achievements of the department, division and company.

The platform that PGB uses to manage staff performance is called the Individual Performance Contract (IPC). The IPC contains two categories: (i) performance planning and (ii) performance review. The elements of performance planning are the key objectives, performance standards and performance indicators. Performance review comprises the results and performance rating.

Staff IPCs are managed through an electronic system called Performance Planning and Appraisal (PPA). Each staff member has to plan and review their IPC with their manager at least three times a year. There is one session for planning and two for mid-year and year-end review sessions. This system and the Business Performance Tracking System measures and monitors performance by division, department and on an individual level. Any hiccups and/or obstructions in executing individual objectives and tasks can be addressed and resolved efficiently.

Management of change

Management of change (MOC) is one of the vital elements in PGB's pipeline integrity management system. The main principle of MOC is that any change needs to be evaluated to ascertain its impact on the safety of personnel, the public and the environment, as well as on current operations and maintenance practices and any financial implications.

MOC procedures have been established so that management and staff are guided in executing the process. The MOC procedures are based on the principles of Process Safety Management (PSM). As mentioned above, in PGB, MOC is managed through an electronic system (e-MOC) which has the following capabilities:

- Registration of MOC by any member of staff who should provide information about the proposed changes and reason/s for affecting the changes;
- Evaluation of impacts (as described above);
- Review by MOC committee;
- Endorsement/approval of MOC by an approving authority; and
- Monitoring of progress of MOC by a focal person.

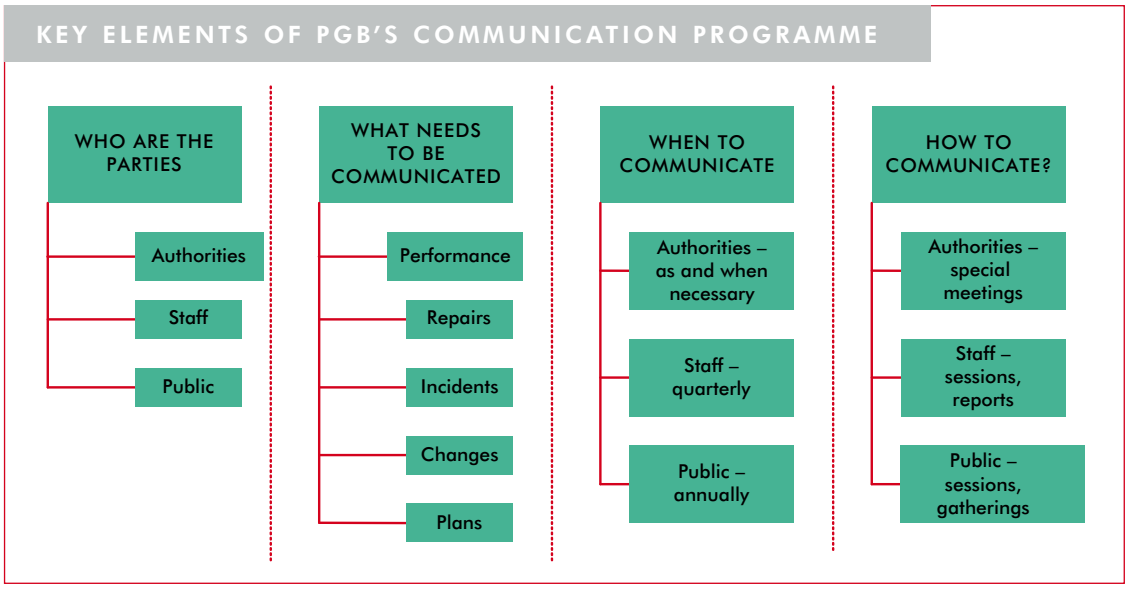
Communications programme

Our organisation believes in effective communication as one of the integral elements of our management system. PGB implements communication programmes with regulatory and local authorities, its staff and the public. These three groups of stakeholders need to be informed about the company's performance, pipeline inspections, repair plans, incidents, lessons learnt from any incidents and changes to the pipeline system. Through effective communication programmes, the stakeholders will appreciate the importance of pipeline integrity. This, in turn, helps with cooperation and commitment from stakeholders. *Figure 4 (over)* shows the key elements of the communication programme.

Quality control

The final element in the pipeline integrity management framework is quality control. To ensure the management system is effectively implemented and maintained, PGB conducts an internal audit on an annual basis and a third-party audit every three years.

The internal audit is carried out by cross-divisional and departmental teams. At the end of the audit session, a report with observations for



RIGHT
Figure 4.

improvement is released. The concerned departments are then responsible for taking necessary action to make any improvements.

The third-party audit for system effectiveness is normally conducted by SIRIM, a Malaysian certified ISO body.

PGB has been carrying out internal and third-party audits since 1995. Each year we see improvement, especially with a reduced number of non-conformances. It really shows that the management system works effectively and our staff members are continuously learning and working towards achieving company and division objectives.

Emergency response management

Pipeline integrity management is not complete without an effective emergency response management system. At PGB, we have an integrated emergency response system that comprises three elements:

- An Emergency Response and Incident Command System (GERICS) which identifies the level of emergency and the type of response associated with each level;
- A Business Continuity Plan (BCP) which provides guidelines to deal with the failure of business processes including information technology; and
- A Pipeline Repair and Rehabilitation Procedure which provides guidelines for performing repairs on pipelines depending on the type of defect and failure.

PGB also conducts annual emergency response exercises at regional and national levels to prepare the authorities, support services, operations personnel, customers and the public to deal with pipeline emergencies.

Conclusion

The success of the total pipeline integrity management system can be seen from the pipeline reliability rating of PGB's pipeline system of 99.97%, a near-perfect score. On top of that, a reduction in pipeline inspection and maintenance expenses has been achieved from the implementation of this system.

Mohd Nazmi bin Mohd Ali Napiah of Petronas is the Leader of Study Group 3.2, Working Committee 3 – Transmission. This is an edited and updated version of a paper originally prepared for WGC2009.

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The World's UCG Endowment – A New Opportunity

By Ilhane Dib

Current endowment and resource assessments for unconventional gas (UCG) indicate very large in-place volumes and resource potential that may be several times the cumulative produced volumes and current reserve estimates.

However, physical, technical, commercial and other constraints make only a fraction of any endowment available for extraction. The main consideration for maximising the potential of any energy source is how to convert the resource endowment to economically and environmentally viable production and ensure its effective delivery.

Endowment and recoverable resources are fundamental concepts in any discussion of energy supply.

Endowment refers to the earth's physical store of potential energy sources: tons of coal, cubic metres of natural gas, etc. The endowment of fossil hydrocarbons is fixed: it can be depleted but not replenished.

Recoverable resources are a subset of the hydrocarbon endowment – the portion that can be viably produced and converted to fuel and power.

The natural endowment is the foundation of all supply projections. Although there are many estimates of future reserves and production, these are often based on the same resource estimates, principally data compiled by energy companies and governmental agencies.

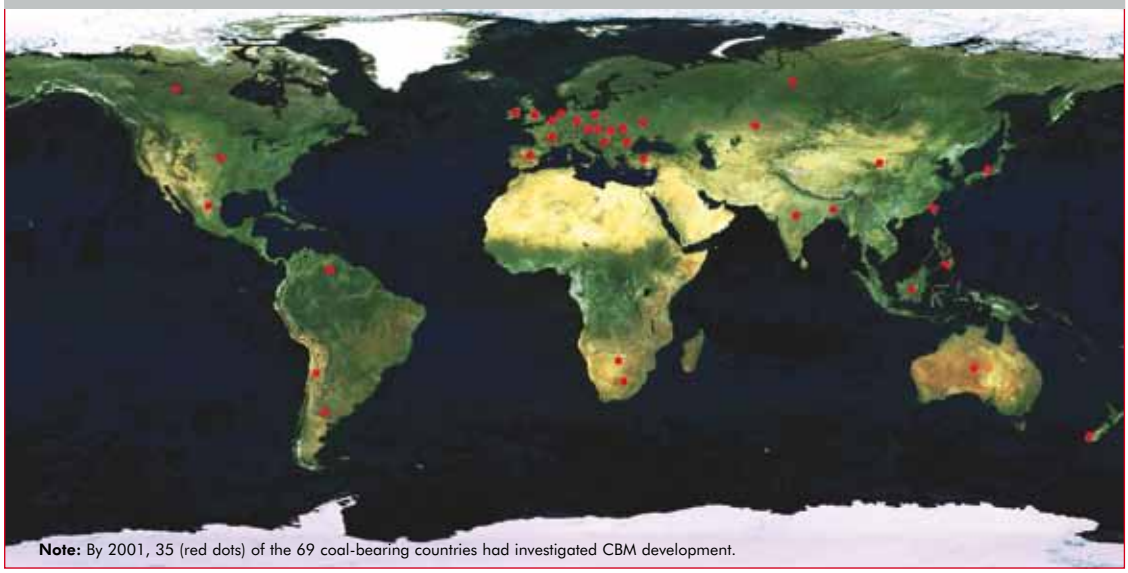
How do we evaluate unconventional resources?

Unconventional resources require different approaches for their evaluation.

In the case of UCG, resources exist in petroleum accumulations that are pervasive throughout a large area and are not significantly affected by hydrodynamic influences (also called continuous-type deposits). Examples include coal-bed methane – CBM (*see Figure 1*), tight sands gas (*see Figure 2*), shale gas and gas hydrates. Typically, such accumulations require specialised extraction technology such as dewatering of CBM and massive fracturing programmes for shale gas.

RIGHT
Figure 1.

CBM DEVELOPMENT



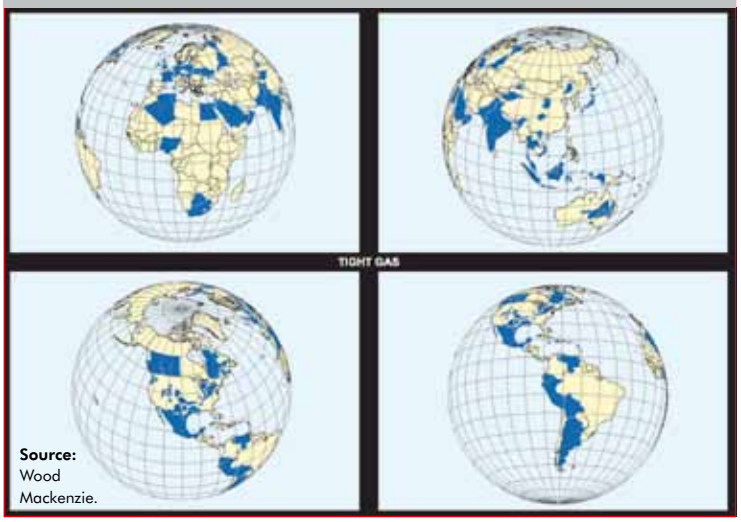
Note: By 2001, 35 (red dots) of the 69 coal-bearing countries had investigated CBM development.

For petroleum accumulations that are not significantly affected by hydrodynamic influences, reliance on continuous water contacts and pressure gradient analysis to interpret the extent of recoverable petroleum may not be possible.

To support the detailed design of specialised mining or in-situ extraction programmes, there is typically a need for increased sampling density to define uncertainty of in-place volumes, variations in reservoir quality and hydrocarbons and their detailed spatial distribution.

Definitions of resources and the classification system should be appropriate for all types of petroleum accumulations regardless of their in-place characteristics, extraction method applied, or degree of processing required.

GLOBAL DISTRIBUTION OF TIGHT GAS RESOURCES



Source: Wood Mackenzie.

ABOVE
Figure 2.

BELOW
Table 1.

Estimates of UCG endowment

UCG reservoirs represent a vast, long-term, global source of natural gas but they have not been appraised in any systematic way.

In a landmark study published in 1997, H. H. Rogner estimated the world's UCG endowment as:

- 256 tcm of in-place CBM,
- 456 tcm of in-place shale gas; and
- 209 tcm of in-place tight sands gas.

A regional breakdown of UCG resources based on Rogner's work is shown in the table. UCG resources constitute a major share of remaining natural gas resources in the US.

In 2002, the French Institute of Petroleum (IFP) estimated that around 585 tcm of UCG might ultimately be recovered from CBM, shales and tight, ultra-deep or pressured formations around the world.

In a more recent study published in 2008, Gazprom VNIIGAZ estimated the worldwide UCG endowment as:

- 200-250 tcm of in-place CBM;
- 380-420 tcm of in-place shale gas; and
- 180-220 tcm of in-place tight sands gas.

Many of those who have estimated the volumes of gas in place within UCG reservoirs agree on one thing: that it is a large resource. Based on the US experience and the fact that a significant number of geological basins around the world contain UCG reservoirs, there is good reason to

ESTIMATES OF UCG RESOURCES BY REGION (TCM)

Region	*CBM*	*Shale gas*	*Tight gas sands*	*Total*
North America	85.4	108.8	38.8	233.0
Former Soviet Union	112	17.8	25.5	155.3
Central Asia and China	34.4	99.9	10.0	144.3
South Asia	1.1	0	5.6	6.7
Pacific OECD	13.3	65.5	20.0	98.8
Other Asia-Pacific	0	8.9	15.5	24.4
Latin America	1.1	59.9	36.6	97.6
Middle East & North Africa	0	72.2	23.3	95.5
Sub-Saharan Africa	1.1	7.8	22.2	31.1
Western Europe	4.4	14.4	10.0	28.8
Central & Eastern Europe	3.3	1.1	2.2	6.6
WORLD	256.1	456.3	209.7	922.1

Source: Kawata Y. and Fujita K., *Some Predictions of Possible Unconventional Hydrocarbons Availability Until 2100*, Society of Petroleum Engineers, SPE Paper 68755, 2001.

expect that UCG production will increase significantly in the coming decades.

A strong future for UCG

A greater understanding of the size and availability of UCG has revolutionised world natural gas supplies.

The revolution began a decade ago in North America with low-cost CBM production in the San Juan Basin of Colorado and New Mexico. This was followed by the introduction of high-volume tight gas production from the Jonah and Pinedale fields in western Wyoming and the emergence of the great gas shale plays such as the Barnett Shale, Horn River, Marcellus and Haynesville.

The breakthrough occurred when gas companies understood that a permeable reservoir could be created and high rates of gas production achieved by using intensively stimulated horizontal wells (see *Figure 3*). This enabled the deep, low permeability shale gas formations to become highly productive.

Today, the pursuit of UCG in the rest of the world has only just begun, with Australia, China and Europe in the lead.

Europe's shale gas geology is challenging, but its resource endowment and potential are large. China has numerous shale gas basins that are only now starting to be evaluated by such companies as PetroChina and Shell in Sichuan Province.

Based on the experience so far in North America and Europe, it is likely that Rogner's resource endowment estimate for shale gas (456 tcm) will prove to be conservative.

Obstacles to the success of UCG

Several obstacles need to be overcome if UCG is to become one of the major pathways to a low-carbon economy.

Firstly, considerable doubt still exists about the true quantities of UCG in the world. Therefore, detailed basin-level assessments of UCG are essential to build confidence and show that sufficient supplies of natural gas exist to offer a major climate change mitigation option.

Secondly, environmental concerns about UCG production need to be addressed. Pursuing environmentally acceptable hydraulic fracturing and re-using produced water will help make the process more widely acceptable.

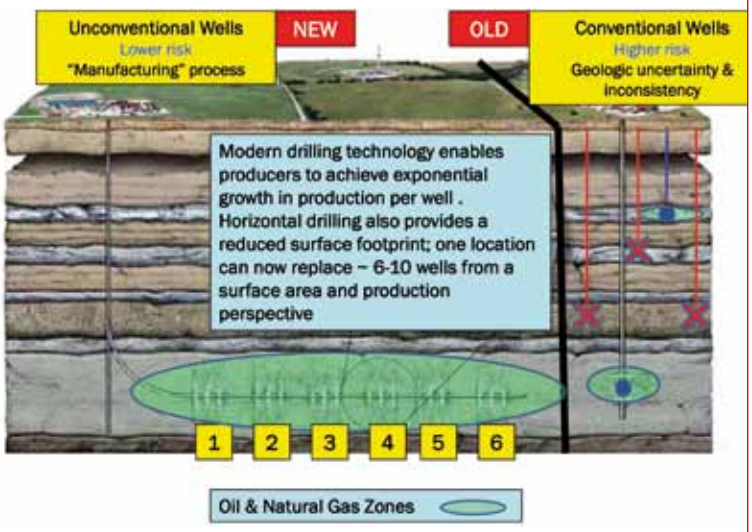
Thirdly, the demand for natural gas in a carbon-constrained world needs to be developed.

Addressing these issues will allow to us to reap the maximum benefit from the world's UCG endowment.

Ilhane Dib of Sonatrach is the Secretary of Working Committee 1 – Exploration and Production.

BELOW
Figure 3.

SHALE GAS – ADVANCED DRILLING AND COMPLETION TECHNOLOGIES



Source: Chesapeake Energy.

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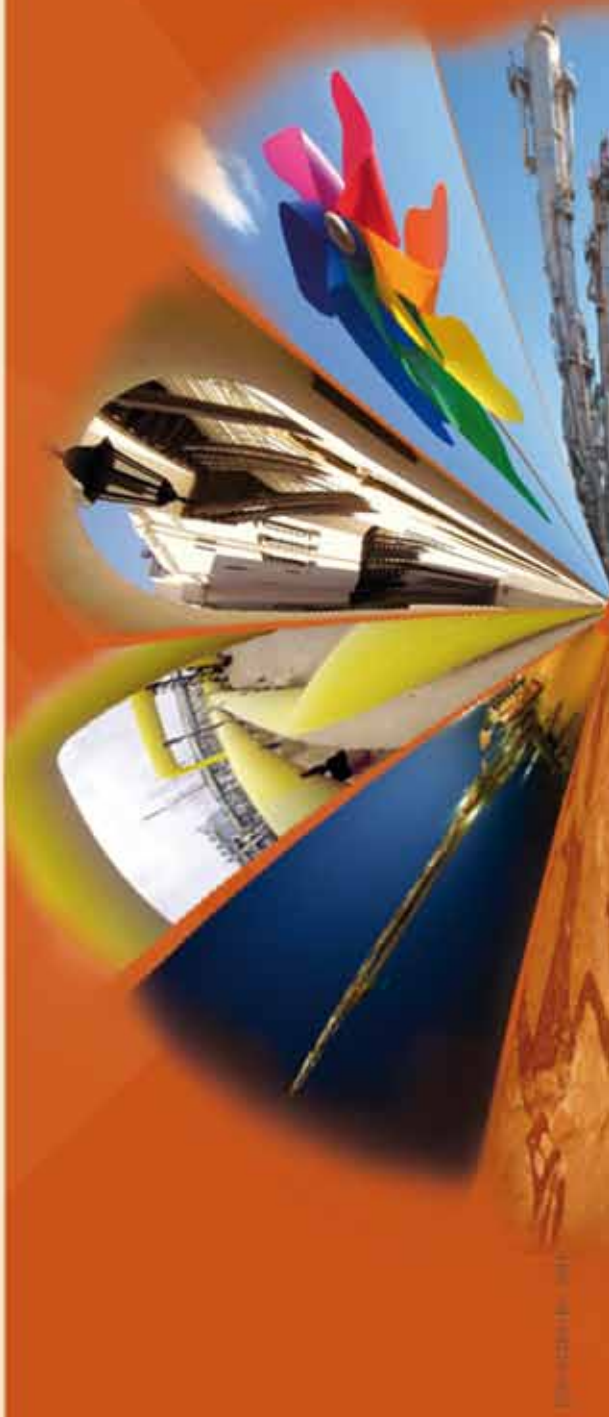

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A Very Unconventional Gas Field

By Adrian Giddings

Forming part of the border between the Democratic Republic of Congo and Rwanda, Lake Kivu is one of Africa's Great Lakes and a potential source of energy for the countries that surround it. This potential comes, however, not from a hydropower project, but from 55 bcm of dissolved methane in its deep waters.

Unlike most of the world's lakes Kivu is meromictic, the waters of its depths never mixing with those at its surface. Whereas a normal lake's waters will mix at least once a year refreshing the oxygen content of the lower waters, Kivu and lakes like it have stratified layers where the chemical mix is constant. This unusual state of affairs has helped to create the unique conditions for a raft of new natural gas projects to be developed. But while they could provide the answer to the region's energy needs, there are risks that need to be carefully managed.

Kivu is one of three so-called "exploding lakes" (along with Lake Nyos and Lake Monoun in Cameroon) although it is the only one of the three which contains commercially recoverable amounts of methane. These lakes are capable of releasing the gases they contain in rare but catastrophic limnic eruptions or lake overturns, so exploration and thorough understanding of their structure is vital.

There was an eruption of CO_2 at Lake Monoun in 1984 that resulted in 37 deaths and a far larger one in 1986 at Lake Nyos that released 1.6 million tonnes of CO_2 killing 1,700 people and 3,500 cattle. The population density around Lake Kivu is much greater with some two million people at risk unless there is controlled unlocking of the gases dissolved in the lake's water. The stakes are high but with prudent husbandry of Kivu's resources the benefits could be immense for the people of the region.

The calm waters of Lake Kivu contain the answer to a region's energy needs.

Taking up the challenge

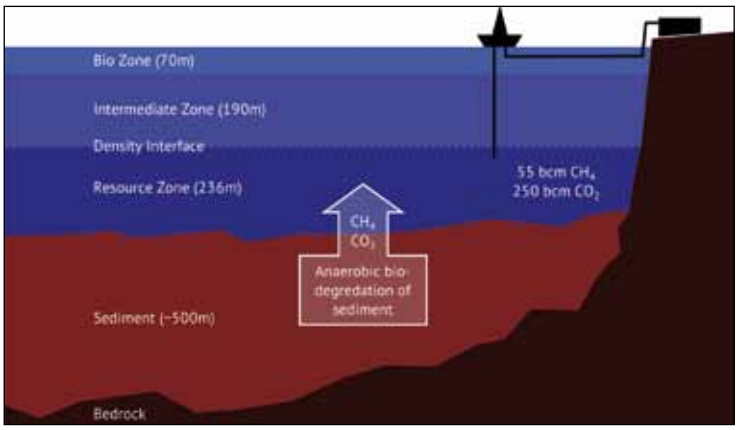
Rwanda and the Democratic Republic of Congo have engaged in dialogue and partnership regarding joint exploitation of the lake's gas reserves since the mid-1970s. In 1990, the two countries established Société de Contrôle de l'Exploitation du gaz Méthane du Lac Kiev (SOCIGAZ), a bilateral regulatory authority which governed the extraction of gas reserves in the lake. In 1999, the body was reformed to allow both states to assign concessions for projects in their respective territories.

The risks inherent in harnessing the lake's abundant energy wealth are well known as its unique geology has been extensively studied, most comprehensively in 1976 and most recently in 2007 by an international expert advisory panel jointly appointed by the governments of Rwanda and the Democratic Republic of Congo. After three years of study, the panel comprised of scientists and engineers from Canada and Europe including Eawag – the Swiss Federal Institute of Aquatic Science and Technology – presented a report *Management Prescriptions (MIPS) for the Development of Lake Kivu Gas Resources* which is used to evaluate all project proposals relating to gas extraction from the lake.

Another barrier to development of the lake's gas reserves is logistical. The lake is 3,000km from the nearest sea port which adds another hurdle to the installation of major energy infrastructure. However, despite the dangers and physical problems involved, the lake is proving attractive to local and international investors wishing to rise to the challenge. At the forefront of these is ContourGlobal.

First large-scale use of Lake Kivu's gas reserves

The US energy company ContourGlobal recently reached an important point in the development of its KivuWatt project, a gas extraction facility and power plant based at Kibuye, Rwanda, which will have an ultimate capacity of 100MW. The project will be the first large-scale use of Lake Kivu's abundant gas reserves.



The stable stratification of the lake's waters has created the methane reserve that is soon to be harvested.

In May, ContourGlobal announced that it had secured a $142 million investment guarantee from the World Bank's Multilateral Investment Guarantee Agency for Phase 1 of the project. This support will be of assistance as KivuWatt works to finalise project financing with a syndicate led by the African Dev-

This gas extraction and processing barge for a proof of concept project has been operational since 2008.

Bralirwa was the first concern to use the lake's abundant gas commercially.

elopment Bank, the Emerging Africa Infrastructure Fund and the Dutch development bank FMO.

Phase 1 consists of two elements: a gas extraction and processing barge moored near the Rwandan coast which will draw methane from 350m below the surface of the lake and an onshore 25MW power plant with three generator sets located in Kibuye. Once processed on the barge, the gas will be transported via a 13km semi-submerged pipeline to the power plant and used to generate electricity. This is the country's first independent power project and will more than double current electricity generation capacity. There will be scope to export electricity to neighbouring Uganda, Burundi and the Democratic Republic of Congo.

Phase 1 will serve as a pilot so that any lessons learned through its operation can be fed back into the development of the second phase of the project. This will boost capacity by 75MW with a further three extraction and processing barges and nine more generator sets at the power plant.

Wärtsilä commenced construction of the first phase's power plant in May and at press time the barge was due to launch at the end of August. The project is expected to be in service in 2012.

The final cost of the two phases is projected to be $325 million and is part of a 25-year gas-to-power deal between ContourGlobal and the Government of Rwanda. The electricity generated will be sold to Rwanda's Energy, Water and Sanitation Authority (EWSA) and distributed through the national grid via a new 1.6km, 11kV transmission line that is being installed by EWSA.

Other projects under development

While it is the furthest along in terms of development, KivuWatt is not the only major power project being planned for the lake.

A company called Kivugas Energy has been founded and is in discussions to form a consortium to apply for a concession to build a gas-to-power project on the lake. Kivugas is using a new technology called Hydragas which was pilot

tested for 18 months beginning in 2004. The pilot included a test flaring of gas for six months. Detailed design for a 5MW single-module and 10MW dual-module gas extraction plants have also been completed. Commercial-scale developments are planned to involve between eight and 16 of these modules supported by a single offshore platform that will be able to extract between 80 and 160 mcm of methane per year generating 30-100MW of electricity.

Further, the Rwanda Energy Company, a subsidiary of the Rwanda Investment Group has been granted a 40-year gas concession to develop a gas-fired power plant. The Memorandum of Understanding signed with the Government of Rwanda is for 50MW of electricity production capacity and will be converted into a power purchase agreement when the company's gas technologies have been proven. Pilots to prove the economic viability of the company's production methods are being developed and the first stage of the project will be to build a 4MW plant at Rambo.

In the beginning

While ContourGlobal's project is the largest to be undertaken on Lake Kivu it is by no means the first. The presence of methane in the lake has been known since the 1930s and was first commercially extracted in 1959 when Brasseries de Leopoldville opened the Bralirwa (Brasseries et Limonaderies du Rwanda) brewery in Gisenyi on the Rwandan side of the lake (Rwanda-Urundi). The gas was used to fire the brewery's boilers. However, the brewery stopped producing its own gas in 2004 and now has to import oil to run its operations. This has increased costs three-fold.

A pilot project called Kibuye Power started up in 2008 but this is now the subject of litigation.

Environmental benefits

The lake's surrounding environment is in need of protection and the gas projects under development will help to safeguard the local flora and fauna. The mountain gorilla population in the nearby Virunga National Park is under threat from the local population's need for agricultural land and energy. Charcoal burning poses a threat to the gorilla domain and to the health of the people of the region. The provision of electricity and the possibility of developing a gas pipeline network for the major urban centres of Goma, Ruhengeri and Gisenyi among others would go a long way to solving this problem. Gas from the lake could be supplied at costs competitive with fuelwood and cheaper than charcoal. Up to a million homes could be supplied with gas using only 25% of the annual output available for extraction from the lake.

While the dangers of exploiting Lake Kivu's abundant gas wealth are very real the potential benefits both for Rwanda and for other nearby countries are immense. With careful planning and operation the lake should provide 300MW of power continuously for 50 years (and perhaps more) at some of the most cost competitive rates in the region.

Adrian Giddings is a Contributing Editor at International Systems & Communications Ltd.

Harnessing the lake's gas reserves will help to avoid deforestation and damage to the surrounding environment.

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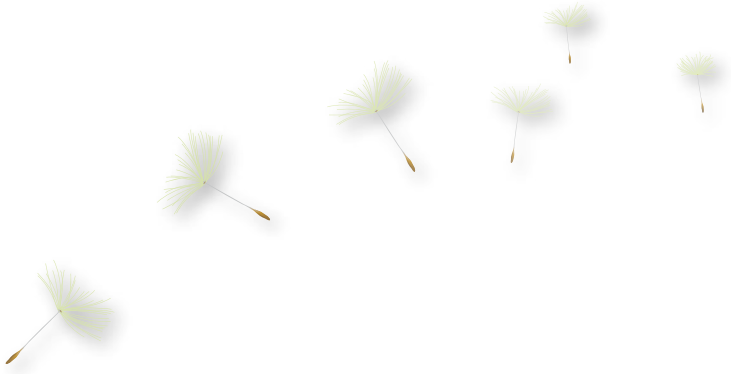

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The Asian Gas Market: Challenges and Potential

By Shigeki Sakamoto

Asian gas markets are facing several challenges, two of which will be focused on in this article:

- Controlled gas prices (with subsidy) and their effects on supply and demand; and
- Unconventional gas developments.

Controlled gas prices and their effects on supply and demand

Gas is traded separately in several independent regional markets and a true global market has yet to develop. Furthermore, many domestic gas markets adopt subsidised pricing. For example, Russia and many major Middle Eastern gas producers, including Iran, supply gas to their domestic markets at a fairly low price. The same can be said of Asian countries, including China, and several Southeast Asian nations, where low gas prices are set through a subsidy system. The gas price is controlled by the government even in South Korea, while a market price is only applied in a few countries, such as Singapore and the Philippines.

The big problem for Southeast Asian gas markets is that demand is increasing throughout the region, while supply in the major gas-producing countries such as Malaysia and Thailand is expected to decrease. Policies allocating domestic gas production to domestic gas markets exist in many Southeast Asian gas-producing countries.

Malaysia and Thailand are examples of countries where policies promoting domestic gas use have been successful, as shown by the high share of gas in primary energy consumption (see *Figure 1*). However, gas supply in both nations will decline in the latter part of the decade (including pipeline gas imports from neighbouring countries). Indonesia has also strengthened its domestic gas supply policy, drastically reducing contract volumes for export since 2010.

Low gas prices based on subsidies have been set to promote gas supply to domestic markets in Southeast Asia (there are similar subsidy policies for oil products), and gas demand has been stimulated as a result. At the same time, however, it has been pointed out that gas use has become more inefficient as a result. Now that the future gas supply is likely to decline, the inherent contradiction in this gas price control policy is more noticeable.

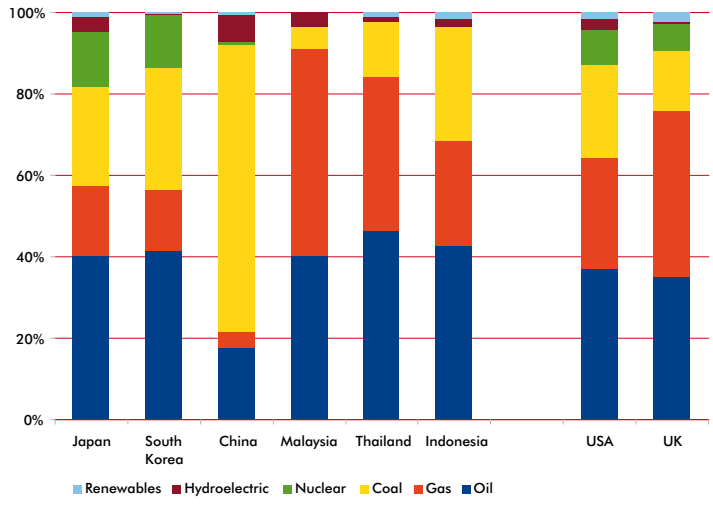
Gas policy in Southeast Asia is often criticised for its inefficiency by international energy organisations. They aim to support development of healthy energy markets and point out that a subsidised, cheap gas supply results in the following effects and impedes the development of a healthy market:

- It harms gas producers' investment incentives, hindering the development of supply; and
- Encourages wasteful gas consumption and increases demand above the supply capacity, disturbing the supply and demand balance.

For the governments of emerging Southeast Asian economies, there are political risks in

BELOW
Figure 1.

SHARE OF PRIMARY ENERGY CONSUMPTION BY FUEL



Source: BP Statistical Review of World Energy, June 2011.

entrusting energy price mechanisms to the market. In Indonesia in the late 1990s, energy price rises for fuels including kerosene – used widely for cooking in the home – initiated popular protests which led to the collapse of the regime. However, now that gas supply capacity is likely to decline, governments are in a difficult situation where they will be forced to raise gas prices to an appropriate level.

Indonesia and Malaysia have been gradually raising gas prices since 2007-2008. In Indonesia, higher energy prices have become more acceptable due to greater social stability compared to the situation in the 1990s. Even so, it will still be difficult to increase gas prices to market rates within the period targeted by the government.

Now that the future limits on gas supply capacity are becoming apparent, concerned governments are finding it very challenging to bring gas prices close to market prices by reducing subsidies and to maintain an appropriate gas supply-and-demand balance. As a matter of course, consumers will object to changes to the low-price energy policy to which they have become accustomed. It is still doubtful whether the gas supply to Southeast Asian markets will develop smoothly in the future. This also leads to a problem in the choice of energy sources in the long term.

There is the prospect that the share of coal in future power generation will increase across the whole of Southeast Asia. If this happens, domestic gas use promotion policies may face significant changes. The gas supply and demand status in the region should be closely observed as economies choose between competing fuels and energy sources.

In Southeast Asia, LNG import projects are making progress in Thailand, Malaysia, Singapore and Indonesia (*see Figure 2*). Each country plans to start operating LNG receiving terminals in the period 2011-2014. Thai national oil company PTT is developing the project at the most advanced stage: the Map Ta Phut LNG receiving terminal in the province of Rayong with a capacity of 5 mtpa received its commissioning cargo in June.

LIQUEFACTION PLANTS AND PLANNED LNG RECEIVING TERMINALS IN SOUTHEAST ASIA

ABOVE
Figure 2.

As we have seen, Southeast Asian countries are gradually losing their supplier status. However, it is unknown how much comparatively expensive imported LNG will be accepted into regional markets, many of which are located in emerging economies. The share of gas will be decided gradually depending on the relative economics of all available energy sources, including coal.

● Unconventional gas developments

Shale gas production in North America is progressing steadily. In its *Annual Energy Outlook 2011*, the US Department of Energy's Energy Information Administration (EIA) assumes a steady expansion in the share of shale gas within total supply in the United States to reach 45% by 2035.

Other organisations also expect unconventional gas to make a growing contribution to the gas supply. Released in June 2011, a special report by the International Energy Agency entitled *Are We Entering a Golden Age of Gas?* envisages a gas consumption expansion scenario, under the condition that gas consumption increases alongside large gas supply capacity expansions (the IEA's gas scenario). That scenario is based on assumptions of a relatively abundant gas supply (*see Figure 3 over*).

The Map Ta Phut LNG terminal in Thailand received its commissioning cargo in June.

It may be said that this scenario puts a more positive emphasis on the contribution of gas to energy supply since it was the first major energy scenario to be announced following Tokyo Electric Power Company's Fukushima Daiichi nuclear power plant accident in March 2011.

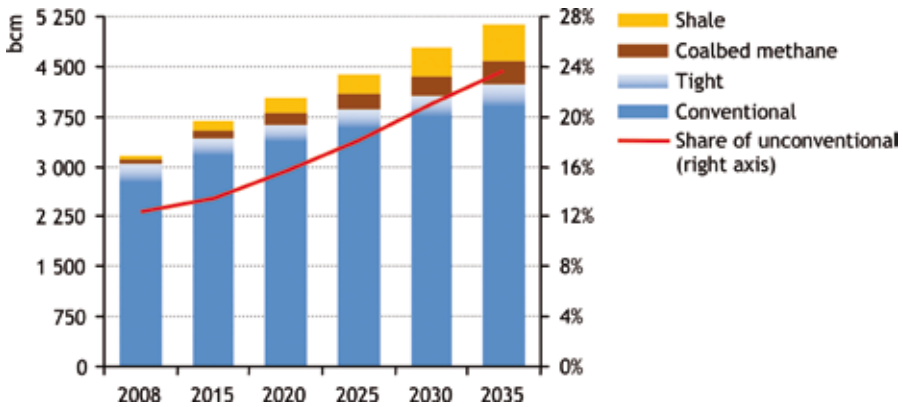
According to IEA's gas scenario, gas production type varies greatly by region and country. The largest potential for unconventional gas supply comes from North America, China and Australia (*see Figure 4*).

Progress in unconventional gas development varies greatly by region. Shale gas development in North America and coal-bed methane (CBM) development in Australia show smooth progress with both countries having a promising market – the world's largest domestic market for the United States and the expanding Asian LNG market for Australia. However, it is impossible to comment on the prospects for unconventional gas development in other areas, since they remain at a very early stage. Moreover, concerns have been raised about the effects of shale gas development on the natural environment.

In New York State, USA, a moratorium has been placed on horizontal hydraulic fracturing pending completion of an investigation, because of

BELOW
Figure 3.

NATURAL GAS PRODUCTION BY TYPE IN IEA'S GAS SCENARIO



Source: IEA special report *Are We Entering a Golden Age of Gas?*, June 2011.

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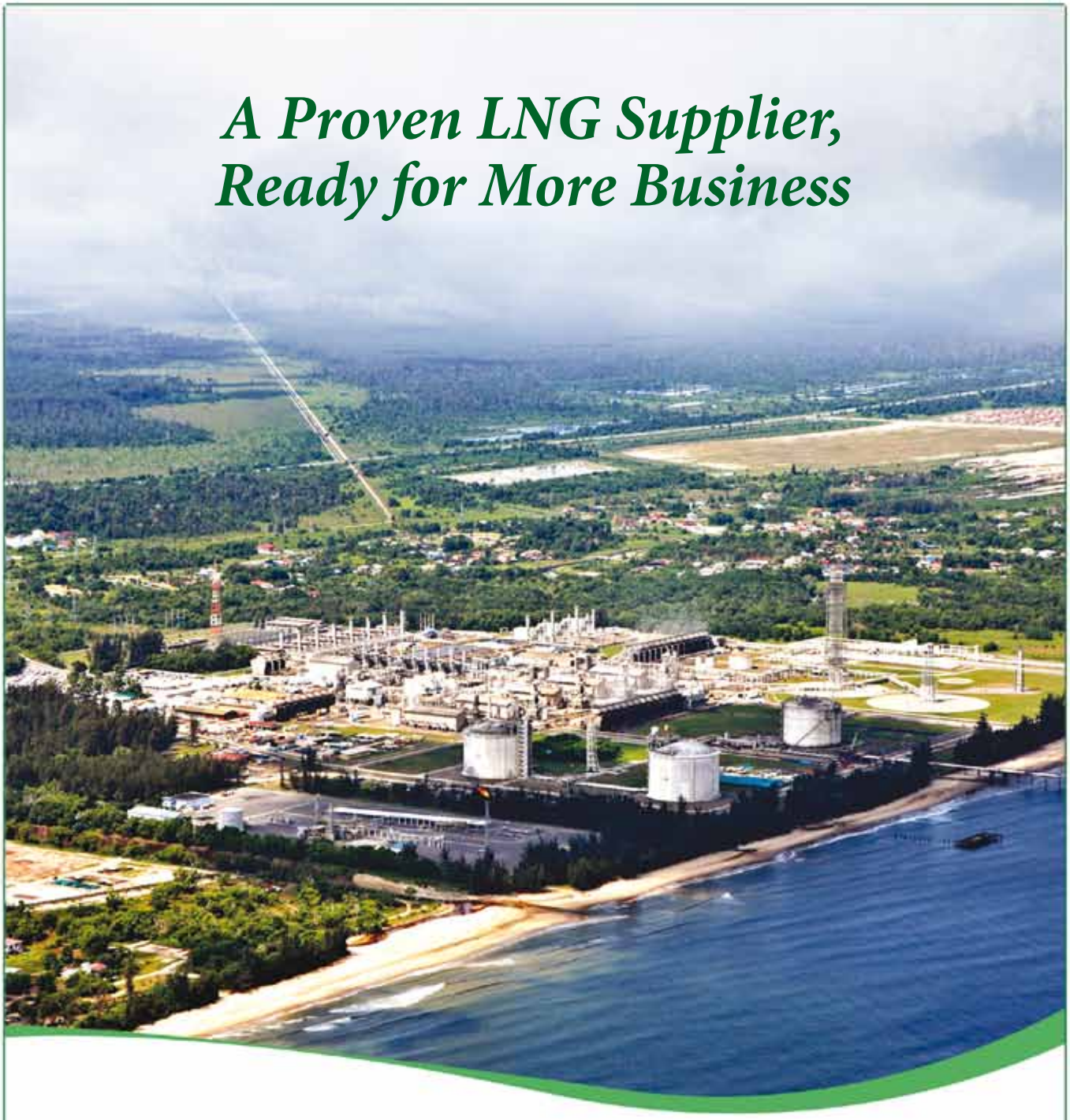

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concern over the possible effects on the environment, including on groundwater.

Europe is regarded as the next target for shale gas development after North America. However, there is even greater concern about potential environmental damage from such development.

In April 2011, the French government announced a moratorium on drilling activities and the cancellation of shale gas development licences that were awarded in 2010, until the effect of exploration work on the environment becomes clear. This was a reaction to vocal opposition to shale gas exploration activity in France.

Some Central European governments, including the Czech Republic's, have announced energy policies which state they should not depend on shale gas development. In Hungary, ExxonMobil withdrew from shale gas development activities after a lack of drilling success.

Only the Polish government seems eager to push for shale gas development, and exploration activity funded by foreign capital is being carried out there. Exploration activities are almost at a standstill in other European countries. A further negative factor is that European onshore geological data remains insufficient, unlike the United States.

The share of unconventional gas in overall supply also varies greatly by area in BP's *Energy Outlook 2030*, released in January 2011. Its share in Europe is extremely low and it is also quite restricted in China. Furthermore, increases in unconventional gas supply in China only begin to show after 2030.

Unconventional gas development in Asia is at an extremely early stage. CBM is being produced on a small scale or at the pilot production stage in major coal-producing countries such as China, India and Indonesia. The Chinese government has outlined an aggressive production plan, but results have fallen short so far. Against a plan made in 2005 (in which the target for 2010 was 10 bcm), production amounted to just 1.7 bcm in 2010.

On the transportation side, a lack of progress in allowing third-party access has often been pointed out, since state-owned PetroChina holds large exploration acreage and exclusively operates the long-distance pipeline systems. Therefore, the market is limited to small gas power stations near CBM production sites, local CNG filling stations and small liquefaction facilities. The market has not expanded greatly so far.

Correction of other institutional deficiencies, support for infrastructure reinforcements and development methods should also be considered. In Indonesia, the number of CBM projects is increasing, and there is a plan to supply CBM to an LNG plant. But more time and development is needed before commercial production can get on track.

As for shale gas development in China, the Chinese government and the state-owned oil companies concerned are not making any sudden departures from their careful positions. Instead, expectations

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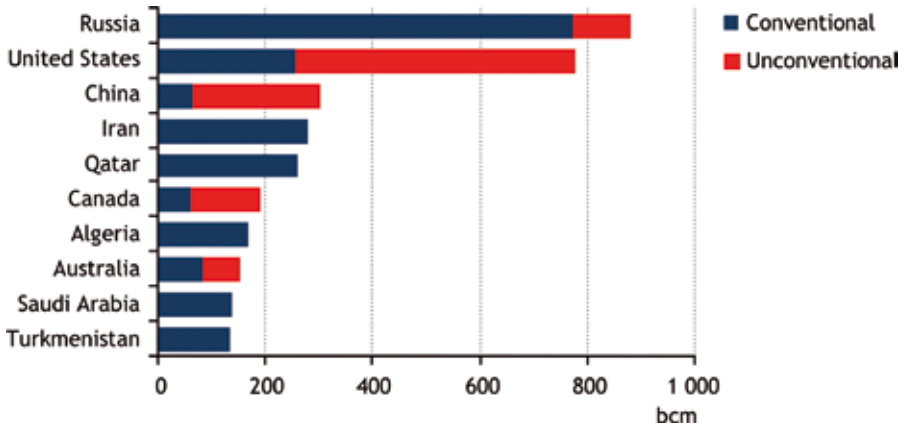
Figure 4.

TARGET GAS PRODUCTION BY TYPE IN THE GAS SCENARIO, 2035



Source: IEA special report *Are We Entering a Golden Age of Gas?*, June 2011.

China gas market in context

Chinese gas demand growth is now a critical factor in the future of the global gas market. The fundamentals behind gas demand growth are not driven purely by GDP, but by a combination of factors, including policies to diversify the energy mix and to mitigate the country's growing reliance on oil imports. While domestic supply is continuing to grow, the pace of demand means that output cannot keep pace. China must therefore secure significant additional volumes of imported gas, above existing contracted levels, in the form of both LNG and piped gas to meet forecast demand growth.

Putting the China gas market in context:

- The Chinese gas market is, and will remain, the fastest growing major gas market globally
- China will be the world's largest net importer of gas by 2017
- China will become the world's second largest gas market after the US by 2026
- The full potential of unconventional gas development in China is not understood. China's future CBM and shale development could yet re-define the country's import requirements
- Without the continued expansion and promotion of gas, China's 2020 environmental targets will not be met

China is now at a critical juncture in its gas market development as domestic gas prices do not yet reflect the cost of imports. With rising oil-indexed imports, China's weighted average cost of gas is increasing significantly. Consequently, price reform is required to address this near-term. In the medium-term, a rebalancing of the relative level of end-user prices is required to reflect the true economics of supply to different end-user sectors. The uncertainty over the timing and the content of price reform is now a major obstacle to the development of a market which will increasingly play a role in shaping the global gas environment.

Wood Mackenzie's China gas team are currently developing a dedicated research service that will consider the overall development of the China gas sector and its impact on China's energy mix.

To learn more please visit www.woodmac.com/energy/chinagasservice

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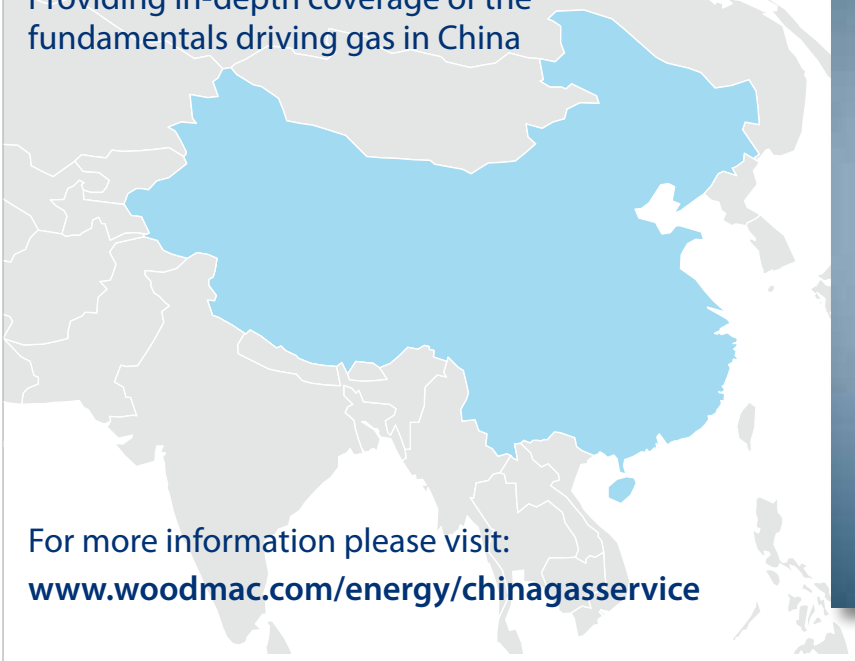

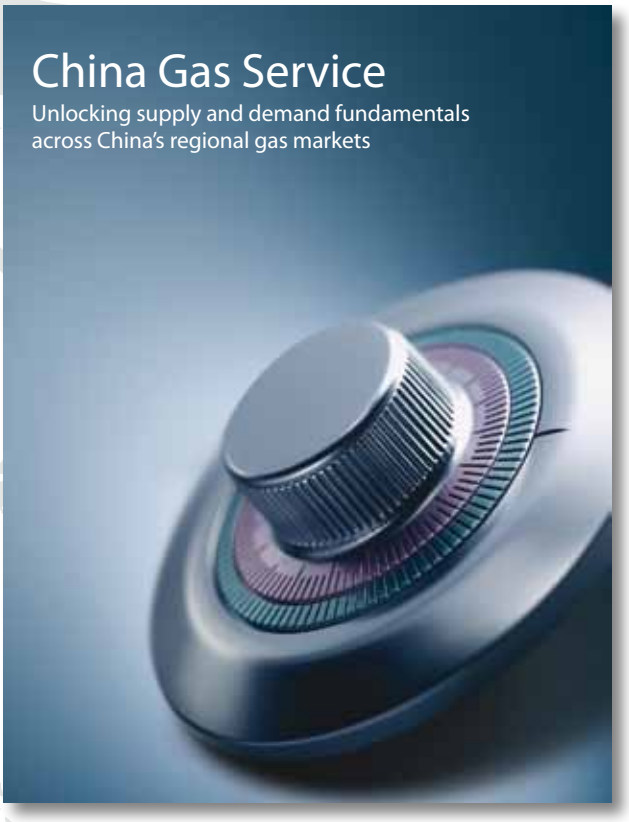

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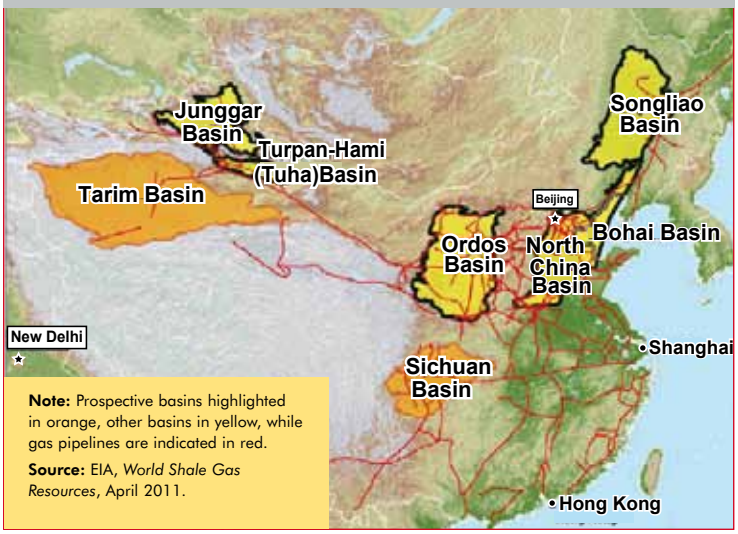
SHALE GAS BASINS IN CHINA



Note: Prospective basins highlighted in orange, other basins in yellow, while gas pipelines are indicated in red.

Source: EIA, *World Shale Gas Resources*, April 2011.

ABOVE
Figure 5.

seem to come mainly from outside the country.

In April 2011, the US EIA announced its findings on world shale gas potential (*World Shale Gas Resources: An Initial Assessment of 14 Regions Outside the United States*). In the report, China is ranked as having the largest technically recoverable shale gas reserves (35.7 tcm), followed by the United States (24 tcm), Argentina (21.6 tcm) and Mexico (19 tcm). This research was evaluated by using only available existing data, so there are natural limitations to its quality.

Research on unconventional gas resources in China should be conducted by using the existing geological data held by PetroChina. In China, gas exploration is limited to existing production areas (Sichuan Basin, Xinjiang Uygur Autonomous Region, Ordos Basin), and it is thought that the precision of data on a nationwide scale is rather poor.

On the Chinese side (the government and state-run oil companies), as well as foreign oil producers conducting business in China, there have been subdued reactions to the research results by the US DOE. Entry into shale gas development in China by foreign capital is limited due to Chinese institutional conditions. All the companies chosen for a shortlist in the first round of shale gas acreage bidding in the first quarter of 2011 were Chinese. It is thought that they will form joint ventures with foreign firms after acquiring development rights. Foreign firms, however, seem to want the government to improve terms for shale gas development in China.

BP China considers deficiencies in transportation facilities to be an obstacle to unconventional gas development in China, because third-party access to the main pipeline, operated exclusively by PetroChina, is not guaranteed.

Shell carries out gas business worldwide in cooperation with PetroChina (e.g. in Australia), and has the closest contact to Chinese gas policymakers among the foreign majors. Shell's opinion is that China should learn from successes in North America, encourage foreign participation and introduce public incentives to foster successful shale gas development.

PetroChina's priorities in the gas business are, first, the development of conventional gas resources, and, second, pipeline gas imports from Central Asia and Russia. Unconventional gas development is a future business that comes after these priorities. However, PetroChina seems willing to push forward development work in alignment with government policy to some extent, because it does not want to lose its existing development rights.

Experts often comment that unconventional gas production in China will only get into full swing after 2020 at the earliest.

It is generally believed that for unconventional gas development to take off in China, and across Asia as a whole, more geological surveys, and improvements to the regulatory environment and related systems are required. This business will take time.

Shigeki Sakamoto of Japan Oil, Gas & Metals National Corporation (JOGMEC) is the Leader of Study Group C.1, Programme Committee C – Gas Markets.

WorleyParsons

Why gas plants are different for every application is a question that baffles many.

The functional requirement of a gas processing train is to meet a gas export specification, and that depends on the market, whether it is local power generation, pipeline transfer for industrial or domestic use, reservoir reinjection, or as feedstock for a variety of GTP uses or for liquefaction to LNG.

There are liquid products too. Condensate will invariably be produced, but LPG and sometimes ethane may also be required, dependent largely on the local market.

Typically, a Process Engineer will be asked during the conceptual phase of the project to meet the gas export specification using the minimum processing steps, i.e. what are the minimum requirements for hydrocarbon liquid removal to meet a dew point specification and a heating value? There may be economic benefit in recovering propane from the gas stream too, and if so, to what degree and what degree of recovery, complexity, and flexibility should be designed for?

So having ascertained the basic process requirement in terms of hydrocarbon processing, the next step is to determine what level of contaminant removal is required. Typical contaminants are H_2S, CO_2, mercaptans, carbonyl sulphide, mercury, and water, and the level to which their removal is required is determined by the market or downstream processing requirements.

These two requirements, for hydrocarbon processing and contaminant removal, are not independent and plant configuration must be considered holistically to determine the optimum solution.

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The Great East Japan Earthquake and its Effect on Japan's Energy Policy

By Satoshi Yoshida

On March 11, I was sitting in my office on the 22nd floor of the Tokyo Gas Building overlooking Tokyo Bay. It was one of those ordinary Friday afternoons; I was thinking about how hard the week had been and longing to leave the office on time.

At 14:46 I felt a small jolt. At first, I thought it was one of those jolts that happen periodically. But this time I was wrong.

The tremors increased and continued. I hung on to my desk so that I would not be carried away with my chair. My mug of green tea fell from the desk and hit the floor. A bookshelf collapsed and the television tumbled down from the shelf.

Outside my window, the 40-storey Toshiba building was swinging wildly back and forth to ease the force so that it would not break in the middle. I knew from my architectural background that these buildings will easily withstand earthquakes this size, but I got worried as the tremors continued for so long.

They lasted for about five minutes. The building produced an eerie squeaking sound. When the quake stopped, everyone was speechless. I led colleagues to safety down the emergency stairs. The staircase was packed, and it was still squeaking.

As soon as we reached the ground floor and safely exited the building, everyone tried to get in touch with their families using their cell phones. None of the calls got through. We went outside and stood in the cold.

Cell phones with broadcast TV service were reporting that the magnitude of the earthquake

The heavily damaged Ishinomaki gas works in eastern Japan's Miyagi Prefecture after the March tsunami.

was M_w8.9 (later amended to M_w9.0) and the epicentre was in the Tōhoku area some 250km north of Tokyo. As we stood idly outside, the tsunami was already reaching the northeast coastline and small TV screens were broadcasting a huge wall of water engulfing cars, houses and buildings. It was like a scene from a Godzilla movie.

After standing in the cold for a couple of hours, our office building was confirmed to be safe.

The lifts were not operating, so we climbed the stairs back to our office on the 22nd floor. The TV was churning out report after report of the unprecedented destruction caused by the earthquake.

Watching TV, we worried about the damage caused by the earthquake. But the direct damage caused by the earthquake was minor in comparison to the devastation of the tsunami. Some 15m high and reaching 5km inland, it claimed 14,000 lives. More than 10,000 people are still missing and the death toll is still mounting.

The impact of the tsunami on gas plants was immense.

● Municipal gas

Smart gas meters installed in almost all properties shut down the municipal gas supply safely. Only minor damage was reported in the greater Tokyo area. But close to the epicentre in the Tōhoku area, the municipal gas infrastructure was heavily damaged. Sixteen gas utilities, all members of the Japan Gas Association, provided service in the earthquake disaster zone. Municipal gas supply to approximately 460,000 households and buildings was interrupted. The Shin Minato LNG receiving terminal ceased operations.

Thanks to various safety measures, no major accident directly linked to municipal gas was reported, as the gas supply was immediately shut down when an earthquake was detected.

Smart gas meters are installed in more than 99% of properties with municipal gas service. The meters will automatically shut down the municipal gas supply in case of leakage or earthquake.

The Japan Gas Association swiftly coordinated relief teams from its 51 member companies. Hundreds of thousands of gas company employees rushed to the area to assist local gas companies to resume municipal gas service.

As of May 17, municipal gas service was resumed to all interrupted customers except for those households and buildings swept away by the tsunami. The Shin Minato LNG terminal at Sendai Bay remains closed pending repair and is not expected to reopen until May 2012 at the earliest. Municipal gas is now supplied by a pipeline running across Honshu Island from Niigata.

● Nuclear power plant

The tsunami immediately following the earthquake severely damaged one of Japan's largest and oldest nuclear power plants, Fukushima Daiichi Nuclear Power Station (1F). The tsunami knocked out all the emergency backup power and diesel emergency generators, and left the nuclear plant, already deprived of grid power with the first strike of the earthquake, without any power at all.

The cooling system failed and the reactor core was exposed. Partial nuclear fuel meltdown followed only hours after the earthquake and tsunami. Moreover, the cooling system for the

A drinking water safety scare in the wake of the earthquake and tsunami led to emergency supplies of bottled water being sent to Japan courtesy of foreign aid from countries such as the US.

spent nuclear fuel rods stored next to the reactors before they are transported for treatment also failed. They were still radiating heat at the time.

A mass evacuation was ordered for local residents within a 20km radius of the nuclear power plant. Ironically, the people suffering the most were not users of any of the power generated from the power station that has caused such trouble. All of the power generated at 1F was for the greater Tokyo area some 200km south. This is typical of centralised power systems that place their plants safely far away from the densely populated area where more power is needed.

Tension was especially high after the government said on March 19 – eight days after the earthquake – that radioactive iodine was detected in tap water in Tokyo. The government insisted that the amount of detected radioactive iodine would provide no immediate health risk and that it was safe to drink. But it added that it would be preferable if infants and pregnant women used bottled water instead.

It had been taken for granted all over Japan that tap water was safe to drink. In recent years, the Tokyo Metropolitan Government strongly promoted tap water instead of bottled water as clean, safe and good for the environment.

With this announcement, the nuclear accident was suddenly brought to the doorsteps of Tokyo residents. Bottled water disappeared from supermarket shelves within a couple of hours of the news being announced.

At the Fukushima plant, desperate measures to prevent the emission of nuclear materials continue up to the present. After three months, the stabilisation and clean-up of the crippled nuclear power plant is nowhere in sight. Reports of radiation detected in vegetables and tea leaves still create fear in people's minds.

It's sad and ironic that this worst (Level 7) nuclear accident happened in a country that has already suffered gravely from the atomic bombs dropped on Hiroshima and Nagasaki. People are already very sensitive about nuclear issues.

● The effect of the nuclear power plant shutdown

Promotion of nuclear power is the mainstay of Japan's current energy policy. According to *Nuclear Technology Review 2010*, published by the International Atomic Energy Agency (IAEA), 54 of the world's 431 reactors are in Japan, totalling 46,823 MWe capacity. In terms of numbers and total capacity, Japan is the third largest nuclear power producer after the United States (104 reactors, 100,747 MWe) and France (59 reactors, 63,260 MWe).

As summer approaches, eastern Japan is facing a severe power shortage. In the greater Tokyo area, peak demand for power this summer is estimated as 55,000 MWe (peak demand was

A relief team briefing in one of the tsunami-affected areas of Japan.

60,000 MWe in 2010) and available capacity 53,800 MWe (as of June 3).

Power utilities are scrambling to increase power supply by maximising existing fossil fuel power plant output and powering up standby or already retired fossil fuel power plants. Natural gas power generation is considered the most reliable and practical means to compensate for the power shortage.

LNG imports by power utilities are estimated to increase by 9.9 to 12.2 million tonnes above 2009 levels, reaching some 50.2 to 52.6 million tonnes in 2011. Qatar has agreed to supply an additional 4 million tonnes and Indonesia 1 million tonnes this year. Russia and Australia are other promising suppliers.

The government is asking businesses and homes to voluntarily cut electricity use by more than 15% this summer. All heavy users (contracting 500kW and above) were ordered by the government to cut electricity use by 15% during weekdays from July 1 to September 22 under authority of the Electricity Business Act.

The imminent power shortage is not the only worry. The future of nuclear power has a significant impact on the nation's energy security and environment.

The Basic Energy Plan of Japan stipulates that nuclear power, which before the earthquake was producing 30% of Japan's electricity, will produce 50% by 2050. Today, the figure is down to approximately 15% due to the shutdowns. Nuclear power was the knight in shining armour for a nation without natural resources. Reprocessing of spent fuel is considered as quasi-domestic energy, avoiding further energy imports from overseas. Japan imports 96% of the energy it needs, but nuclear would have increased energy self-sufficiency from 4% to 18%.

Nuclear power was considered a magic wand contributing to energy security and reduction in the nation's CO_2 emissions. The Fukushima plant's six BWR-type nuclear reactors were built in the 1970s. They had a total generating

After the devastation of March, the smart gas meters which shut down automatically had to be carefully inspected.

capacity of 4.7 million kW and saved roughly 2% of Japan's total CO_2 emissions.

Hamaoka Nuclear Power Station is 200km southwest of Tokyo, in an area where seismologists claim that there is 80% probability of an earthquake of M_w8 class striking within 30 years. On May 6, two months after the earthquake, the Prime Minister strongly requested the operator to voluntarily halt operation, pending further earthquake and tsunami prevention measures.

Japan has been heavily dependent on nuclear energy. Now that Fukushima 1 and 2 and Hamaoka have taken a total capacity of 14,000 MWe off the grid, Japan's CO_2 emissions are estimated to have increased by roughly 5% this summer.

● Future energy policy and role of the gas industry

In recent years, greenhouse gas (GHG) emissions associated with global warming have been at the centre of all environment and energy discussions. At the 64th session of the United Nations General Assembly on September 24, 2009, in New York, Japan committed to a greatly expanded target – a 25% reduction of GHG by 2020 (over the 1990 level), with the stipulation that there would be an agreement on a fair and effective international framework by all major economies, with all agreeing to ambitious targets.

The Basic Energy Plan of Japan stipulates that by 2030 Japan will build an additional 14 new nuclear power plants. Japan has been promoting nuclear power to reduce the nation's GHG emissions on the basis that it is safe. But the accident of Fukushima has cast a thick dark cloud over the future of nuclear power. People are beginning to doubt whether even an advanced technological nation can master nuclear safety.

Now that the further promotion of nuclear power is unclear, Japan needs to reorganise its energy policy. On May 12, Prime Minister Naoto Kan announced that this was his intention.

Prime Minister Kan also gave an address to members of the G8 and the OECD Nuclear Energy Agency during the G8 summit in Deauville, France, saying that Japan will focus on four challenges:

1. Nuclear safety;
2. Efficient use of fossil fuels;
3. Renewable energy; and
4. Energy efficiency potential.

The gas industry can contribute to three of the four challenges. These three could be realised by moving to a decentralised and interconnected energy system. The gas industry has been promoting this distributed energy system for decades.

A distributed energy system integrated with a centralised system can accommodate various energy systems including renewable energy. Shared responsibility and reduced risk can be achieved. The instability of renewable energy systems can be compensated for using conventional technology fuelled by natural gas (e.g. fuel cells, micro gas turbines). The independent but interconnected system is resilient in the face of the unexpected and can minimise and control damage by isolating the area.

Thinking back, this reminds me of an argument in the summer of 2003 when the Eastern Power

Outage occurred in the United States. The Rocky Mountain Institute and others supported a less centralised system over the highly centralised energy system from a security and economic (energy saving) standpoint, whereas those who believed in a centralised system countered that fortification of the existing power grid is the best option.

I wrote an article for a local engineering magazine after the Eastern Power Outage about the future energy system – distributed generation combined with a centralised system to enhance energy efficiency and security. It referred to the advent of the internet connecting small PCs to enhance efficiency and security. This was quickly challenged, with renowned energy academics contending that bytes (communication) and power (energy) are different and therefore it is unrealistic and absurd to compare the two.

Not so long ago, fortification of the centralised power system – "putting all of our eggs in a fortified basket" – was deemed to be logical choice for Japan's energy security.

Revision of Japan's current energy policy has begun. Government, politicians and academics are flocking to discuss this important issue. Japan's future is dependent on this process.

Natural gas itself has played an important role supporting economic growth in this country since 1969 and will continue to play a vital role well into the future. Although the share of natural gas in the total primary energy supply has increased from 1% in 1973 to 17% in 2010, its share is well behind the 25% average share in OECD countries.

Japan remains the largest importer of LNG comprising 36% of global LNG trade since 1969.

Currently, 60% of natural gas is used in the power sector to generate electricity at power stations. But the potential of natural gas is not only limited to fuel for central power stations.

The potential of energy efficiency lies in direct use of natural gas. On-site generation can compensate for the unstable nature of renewable energy.

The natural gas industry can and should play an even more important role by not limiting itself to being a simple power plant fuel supplier but by working with policymakers, academics, customers and all other stakeholders to realise a reliable, resilient and energy-efficient energy system for the restoration of Japan.

Hopefully, the future energy system will be a combination of a distributed and a centralised system for generation and delivery. It is hoped that the system will use various technologies reflecting diverse ideas and systems tailored to local needs.

Japan has learned a hard lesson that one nation cannot rely on just one centralised energy delivery system.

Satoshi Yoshida is the Vice Chairman of Programme Committee A – Sustainability.

An aerial view of the Fukushima Daiichi Nuclear Power Station is a stark reminder of the destruction. Stabilisation work at the plant continues.

ANCIENT KNOWLEDGE GI

About the China Gas Association

China Gas Association (CGA), established in May 1988, is a national non-profit and non-governmental organisation. The work of CGA is overseen by the Ministry of Housing and Urban-Rural Development of the People's Republic of China (MOHURD). Our members are mainly urban gas enterprises and their partners.

CGA is comprised of 12 bodies including: the Secretariat and eight committees focusing on, respectively, Science and Technology, Business Management, Gas Appliances, Product Management, Safety Management, LPG, LNG and Distributed Energy. CGA's membership comprises every regional and governmental gas association located in China's 29 provinces, autonomous regions and municipalities and more than 1,800 gas enterprises and manufacturers across the country.

www.chinagas.org.cn

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VES US THE POWER TO RESPECT NATURE

The Drive Behind Clean Energy Development in China

CGS

About China Gas Society (previously China City Gas Society)

CGS is the non beneficial institute and the sub-academic organisation of the China Civil Engineering Society (CCES) by which CGS is led and authorised to develop all its academic activities in the field of urban gas.

CGS was founded in Dalian, Liaoning province in April 1979, where there are many experts, professors and technicians in the gas field who develop all kinds of the academic activities in order to promote the urban gas business and the technology.

The basic mission of CGS is to attend the conferences of the International Gas Union (IGU) and all relevant activities; to put forward suggestions for urban gas development to the government, recommend technicians, put forward ideas and requests to the government and to develop evaluation projects, technology, consultation and training.

CGS promotes the technical and economic progress of the Chinese gas industry through its members and works towards improving the competitiveness of gas by promoting the development and application of new technologies and best practices.

CGS is organised into six departments: Administration, Academy, International, Consultation, Evaluation and Training.

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Add: Room 217, Building C, No.99, Qi Xiangtai Rd, Heping District, Tianjin, China 300074

www.gaschina.org

Farewell Party of IGU Council Meeting 2005

Shenzhen Dapengwan LNG Receiving Terminal

GAS HEATING CHINA 2011

About "GAS AND HEATING CHINA 2011"

The "GAS & HEATING CHINA" exhibition, sponsored by the China Gas Association, has been conducted for 13 sessions with the first being organised in 1994. At present, it takes place once per year, in a selected city of China, with a display area of over 10,000 square metres. It is now the biggest and most influential comprehensive, international exhibition for the gas profession in China. Thanks to great support from the responsible department of the Ministry of Housing and Construction and the active participation of gas enterprises, "GAS & HEATING CHINA" is well known and acknowledged as a popular brand in China, obtaining the accreditation of domestic and overseas colleagues in the gas profession. We express our great thanks to all enterprises and individuals for their support and participation! "GAS & HEATING CHINA 2011" will be held in Chengdu from 13-17 November, and we cordially invite you to participate in the 2011 exhibition. Your participation is a contribution to Chinese gas development and to the promotion of international exchange and cooperation!

www.gaschina2011.com

The First ICER-IGU Workshop

By Luis Ignacio Parada

The International Confederation of Energy Regulators (ICER) and IGU have held their first joint workshop. It took place in Washington DC on March 8, 2011, with the participation of ICER Chairman Lord John Mogg and IGU President Datuk Rahim Hashim. This first workshop was dedicated to exploring regulatory natural gas issues of global significance and cooperation between energy regulators and the gas industry. It was organised by a small team from IGU and ICER and hosted by the law firm Hogan Lovells.

Over 100 people from 29 countries participated in the workshop by invitation from the ICER Chairman and the IGU President. The moderators and speakers were senior ICER and IGU representatives together with special guests, academic researchers and gas industry experts from around the world.

The workshop's theme was "Regulatory issues of global significance for the gas industry". It was organised as four roundtable discussions on key regulatory issues where the natural gas industry and energy regulators should seek to work together to improve stability, investments, competitiveness, affordability and sustainable growth. Each session had two or three distinguished panellists and a moderator.

The first two sessions took place in the morning and looked at: "Interaction between regulators and operators" and "Regulatory influences on international investment". After lunch the workshop continued with two sessions focused on: "Regulation and gas price formation" and "Environmental aspects of natural gas". Participants discussed the global dynamics and analysed

ICER Chairman Lord Mogg (*third from right*) and IGU President Datuk Rahim Hashim (*third from left*) with some of the joint organising team.

the background of regulation and natural gas. They also identified a wide range of opportunities and approaches for constructive dialogue between regulators and the gas industry on the future development of natural gas markets.

Dialogue, cooperation and investment

After Lori Traweek, Senior Vice President and COO of the American Gas Association had welcomed participants, the ICER Chairman and IGU President opened the workshop, expressing their hopes that the event would enhance dialogue between energy regulators and the natural gas sector.

Lord Mogg introduced ICER, which was launched in Athens in October 2009 at the World Forum on Energy Regulation IV, pointing out that global cooperation among energy regulators is necessary to seek regulatory solutions to global issues. He said that key issues such as security of supply, climate change, competitiveness and affordability, and regulatory best practices are on ICER's agenda.

Datuk Rahim Hashim pointed out that gas markets operate in a global context and said that IGU's work is concerned with all aspects of the gas chain taking into account the economy, customers, technology, safety, environmental issues, international gas trade, cooperation and legal aspects related to regulatory processes and procedures. "The gas industry needs high quality and consistent independent regulation if it is to commit the substantial funding needed for new investments", he declared.

As a result of the discussions during the workshop, IGU and ICER issued a joint communiqué that highlights the interest of both organisations in strengthening their collaboration and dialogue.

Interaction between regulators and operators

The speakers for the first session were Tony Clark, President of the US National Association of Regulatory Utility Commissioners (NARUC), Marcel Kramer, CEO of South Stream and IGU Regional Coordinator, Europe & CIS, and Wilson "Dub" Crook, Manager for Global Gas Regulatory & Legislative Issues at ExxonMobil Gas & Power Marketing Company. The moderator was Professor Jean-Michel Glachant, Director of the Florence School of Regulation.

Participants stressed that the global gas industry is facing an unprecedented period of change. Many countries are in the process of implementing, or have applied new gas legislation. The key conclusions were:

- Globalisation of gas markets necessitates enhanced communication between regulators across national and regional boundaries, the identification of best practices in consultation processes and encouraging the use of such standards.
- A major market-wide issue is the reduction of risk coupled with an improvement of regulatory certainty by sharing and implementing best practices. The management of risk during periods of regulatory and other changes is important.
- Gas consumers should be protected where possible by establishing the right conditions for competition to flourish and a stable, transparent and independent regulatory framework that aids investment decision-making by the industry.

Regulatory influences on international investment

Carlo Crea, Secretary General of AEEG, the Italian regulator, and Chair of ICER's Security of Supply Virtual Working Group, and Abdulla Ahmad Al-Hussaini, Division Manager of Qatargas were the speakers for the second session, which was moderated by Joseph Kellier, Executive Vice President of NextEra Energy (and former Chairman of the US Federal Energy Regulatory Commission – FERC).

Regulators and industry agreed on the importance of enhancing security of supply

internationally. Panellists recognised that the regulatory framework is an essential element in ensuring adequate long-term investments to support secure and sufficient capacity. Natural gas, LNG and unconventional production will require significant investments over the coming decades. The key conclusions were:

- Regulators and the gas industry agreed to continue their dialogue in order to achieve a greater shared understanding of the challenges facing the world's gas markets.
- Industry committed to facilitate the information that regulators require to foster efficient regulation and markets require to function efficiently.
- The gas industry and regulators discussed the need to work to achieve a common perspective on how to ensure secure investment and supplies of gas in both developed and developing markets.
- It was noted that authorisation processes needed to be streamlined to encourage the development of new infrastructure necessary to ensure security of supply.
- Fluent interaction and effective relations between industry and regulators were agreed to be of great help in fostering the investment necessary to increase energy security worldwide by increasing the diversity of gas supplies.
- Efficient investment is one sign of regulatory success.

Regulation and gas price formation

Dr Branko Terzic, Regulatory Policy Leader, Energy and Resources at Deloitte Services LP and a former FERC Commissioner was the moderator of the third session. The speakers were Dr Michael Thomadakis, Board Member of the Greek Regulatory Authority for Energy, Yutaka Shirakawa, General Manager of the New York representative office of Tokyo Gas Co., and Mike Fulwood, Principal Gas Analyst of Nexant and the Leader of IGU's Study Group B.2 Wholesale Gas Price Formation.

Participants agreed that regulation is fundamental in allowing competitive and efficient markets to develop, such as in the transmission sector. The challenge is to ensure the right balance in regulatory intervention so that transparent and competitive conditions can thrive and customers can benefit from fair prices. The key conclusions were:

- Gas prices continue to be regulated in many countries. However, globally the proportion of gas that is priced through traded markets has been steadily increasing.
- Liquid and transparent markets are seen by regulators and gas industry as fundamental to achieving energy policy goals relating to competitiveness, sustainability and security.
- Regulators and industry recognise that retail price controls can often distort or suppress market signals in competitive markets.
- Effective regulation is an important factor in achieving efficient gas price formation.

Environmental aspects of natural gas

The speakers for the last session were Francisco de la Flor, Director of Regulation of Enagás and the Leader of IGU's Study Group B.3 Corporate Strategy and Regulation, Philip D. Moeller, a Commissioner of FERC, and Torstein Indrebø, Secretary General of IGU. The moderator was Peter Gurnham, Chair of Nova Scotia Utility and Review Board.

Participants agreed that natural gas contributes positively to economic growth and sustainable economic activity, usually without reliance on subsidies. Natural gas also has better combustion properties with lower emissions than other fossil fuels. The industry stressed its commitment to increasing energy efficiency and making a significant contribution to reducing harmful emissions. The key conclusions were:

- The gas industry and regulators recognised that natural gas should not be inhibited from contributing to the future low-carbon, global economy.

- Natural gas has the potential to play a central role in moving to a decarbonised world as a partner for renewables.
- The industry and regulators recognise that action is needed to promote research on the sustainable use of energy, and to develop regulatory mechanisms and incentives that enable energy companies to implement efficiency programmes.
- The industry and regulators recognise the importance of continued dialogue to assess and minimise the environmental impact of activities such as shale gas extraction and encourage the continued development of gas industry technologies.

Future commitment

Lord Mogg and Datuk Rahim Hashim closed the first ICER-IGU workshop with a commitment to continue working to strengthen their dialogue and collaboration on the issues raised.

Lord Mogg said that, "As the challenges facing the gas industry become increasingly global, it is essential that regulators and the gas industry discuss the solutions in a global context. The workshop which took place today was an important step in seeking a shared understanding of the way forward for the world's gas markets".

Datuk Rahim Hashim shared this conviction and added that, "Together, we can work to achieve a common perspective on how to ensure secure supplies of gas in both developed and developing markets".

Future workshops will look at investment in international gas infrastructures, global gas market developments and the role of gas in a carbon-constrained world. Key personnel from ICER and the IGU are taking forward these topics of mutual interest with a view to reporting on progress at the 25th World Gas Conference in Kuala Lumpur, Malaysia in June 2012.

Luis Ignacio Parada of Enagás is a member of PGC B.

Philip Moeller, Francisco de la Flor and Torstein Indrebø during the last session.

Members of the IGU Strategy Committee (PGC B) were among 100+ participants at the ICER-IGU workshop.

APX-ENDEX

APX-ENDEX is one of Europe's most experienced energy exchanges, operating spot and derivatives markets for electricity and natural gas in the Netherlands, the United Kingdom and Belgium. Established in 1999, APX-ENDEX provides exchange trading, central clearing and settlement for its spot products and data distribution services, offers benchmark data and provides industry indices. APX-ENDEX has over 400 memberships from more than 15 countries and is seated in Amsterdam, Brussels, London and Nottingham.

The Netherlands as the Gas Roundabout

The Dutch trading hub TTF (Title Transfer Facility) has become the leading hub in continental Europe for trading natural gas. This position is in part the result of the strong position of the Netherlands in the gas industry; besides being one of the biggest producers in Europe and possessing a significant proportion of Europe's gas reserves, the Netherlands has several depleted gas fields available which serve as a gas storage facility. This strengthens the Netherlands role on the international gas markets as well as the country's high-quality gas infrastructure. Combined with the central location in the heart of Europe and the country's know-how and experience with gas, the Netherlands holds a significant role on the European gas market and has an ambition to become the European Gas Roundabout. APX-ENDEX provides spot and futures trading on the Dutch TTF, a liquid gas hub of the Netherlands.

APX-ENDEX's Focus on Gas

APX-ENDEX has a strong presence on the TTF, NBP and Zeebrugge gas markets. The overall volume across the markets experienced 42% growth in 2010, recording a total of 340 TWh. The growth was especially visible on the TTF gas markets where in total there was 210 TWh in volume traded and 21 new members joining the APX-ENDEX TTF spot and futures gas markets, making it the largest continental European gas exchange.

Throughout the past year, APX-ENDEX improved the conditions and made its TTF gas markets more attractive by lowering fees for screen-traded TTF gas futures and by extending the product range at the TTF gas spot market. The new products include continuous hourly and standard block contracts. In addition, the APX-ENDEX within-day market is now viewable in the GTS Gasport screen for a real time view and has had a positive impact on traded volumes.

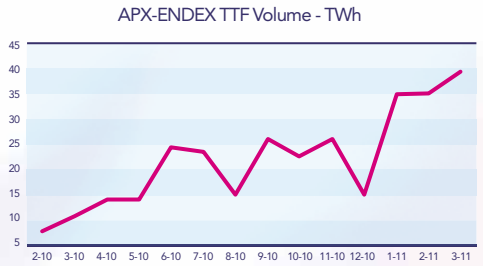
Frontrunner on Gas Storage Services

Together with GasTerra, APX-ENDEX launched the Gas Storage Auction in March 2011 and executed two successful auctions in April. In July 2011 APX-ENDEX and GasTerra announced the extension of their cooperation for the next two years. The service provides market access to almost 2 billion cubic metres of gas storage and is offered in the form of "Standard Bundled Units" (SBUs), which allows market parties to inject natural gas into or withdraw from a virtual storage facility.

APX-ENDEX has developed a single-sided auction mechanism which ensures that the SBUs are sold in a transparent, independent and market-based manner. APX-ENDEX ensures the anonymity of market parties bidding in the auction as well as the confidentiality of all information regarding their bids. Furthermore APX-ENDEX handles storage requests and submits nominations to Gas Transport Services (GTS) for market parties who use the gas storage service.

apxendex.com

Let's step on the gas!



Successful gas trading needs a reliable, secure and dynamic platform. This is exactly what APX-ENDEX has developed: an anonymous market place for integrated trading, clearing and notification of gas contracts. Facilitating one stop shop trading on the whole curve, for real-time balancing, day-ahead and futures contracts.

We call it Europe's gas roundabout, and it is built for heavy traffic. With over fifty trading members and counting, APX-ENDEX TTF is the most liquid gas exchange in Continental Europe, providing a robust reference price that is the benchmark in the market.

To accelerate things further, we recently introduced a Gas Storage Service Auction, providing access to almost 2 billion cubic meters of storage. If you want to speed up your business, why not step on the gas? Visit us at apxendex.com to learn how.

apxendex

Marketing Initiatives for Promoting Gas in a Low-Carbon Economy

By Marc Hall and Barbara Schmid

Under the Malaysian Presidency of IGU, one of the most important initiatives has been to increase awareness of the benefits of natural gas. Within this framework, the CEO of Bayerngas GmbH, Marc Hall, who is also the Chairman of IGU's Marketing Committee (PGC E), organised a summit on May 13 in Munich, Germany. The meeting brought together 33 top-level executives from IOCs and NOCs and marketing experts from 17 countries to discuss the current image of natural gas and the challenges in putting forward a strong case for natural gas as an energy solution in a low-carbon economy.

Datuk Rahim Hashim, President of IGU, underlined the need for enhanced dialogue between policymakers and industry to help natural gas regain its rightful place as the fuel of choice for a clean, sustainable energy future. He told the summit: "With a growing global concern about public budgets, natural gas presents a ready solution that will address the twin challenges of climate change and energy security".

Datuk Rahim Hashim addressing the summit.

The two other major initiatives in Europe for increasing awareness of the benefits of natural gas are being carried out by Eurogas and the European Gas Advocacy Forum (Group of 8). These organisations attended the summit, during which the three initiatives were streamlined and participants agreed that it was crucial for the gas industry to speak with a common voice when repositioning natural gas as a solution for people's energy needs.

Furthermore, it was pointed out that the natural gas industry should increase its visibility and appeal more to the public. The base for this is a clear strategy with coherent messages that avoid promoting natural gas as a bridging fuel and instead anchor its image as the enabler for renewables.

To successfully send the right messages, the necessity of listening to consumers and working closely with communication people was emphasised. It was also mentioned that using social media is a viable way to get rid of the image of natural gas and the gas industry as old-fashioned. The summit made it clear that it is important to share marketing success stories so we can learn from each other.

During the summit the members also discussed important points about the positive side of natural gas.

Munich Declaration

The natural gas industry needs a more effective and consistent voice to emphasise the merits of natural gas in a low-carbon economy.

The main challenges for natural gas are:

- Lack of familiarity among media and the public of the benefits of natural gas;
- The perception that gas ranks with coal and oil as opposed to being a cleaner fossil fuel;
- Influence of geopolitics on the gas business; and

- Discomfort among environmental groups in endorsing greater gas use.

But there are several opportunities:

- Replacing coal with gas in the power mix is the easiest and most cost-efficient way to reach EU CO_2 targets, thus contributing to EU competitiveness and the welfare of its citizens;
- The growing exploitation of unconventional gas has strengthened the security of the supply of natural gas;
- A focus on climate policy and energy security could boost the appeal of natural gas;
- Increased emphasis on renewable energies needs a reliable complementary energy source and natural gas is the perfect partner due to its flexibility and storage capability;
- Production of biogas and other renewable forms of gas can be delivered using the same gas infrastructure – this promotes gas as a "green" energy; and
- New partnerships with social and environmental interest groups can be explored.

The following key messages need to be highlighted by the natural gas industry:

- Natural gas is clean. Gas produces no sulphur and no solid waste. It produces less nitrogen oxide than coal, and more than 50% less CO_2. The environmental benefits of gas can be realised immediately.
- Natural gas is abundant. The reserves-to-production ratio has increased from 60 years to more than 250 years with the addition of unconventional gas. Furthermore, the production of biogas and synthetic gas – which are renewable energies – will steadily increase.
- Natural gas is available now. It is easily accessible from a variety of sources, both pipeline and LNG. It is also distributed for decentralised utilisation.
- Natural gas is more than just a conventional fossil fuel. As a primary source of energy, it is versatile, highly efficient and can be used to generate combined heat and power with minimal conversion losses.
- Natural gas is safe. The natural gas sector has the best safety record in the industry.
- Natural gas is efficient, cost-competitive and reliable. Modern gas-fired power plants are 40% more efficient than coal plants. Gas-fired power demand is increasing due to its availability, cost-competitiveness, proven reliability, best reserve capacity for wind and its contribution towards meeting CO_2 targets.
- Natural gas is versatile. Gas can serve as a flexible partner in power generation for renewable-energy sources like wind and solar. Natural gas is the enabler for renewable energies.
- Natural gas is proven. Its deployment and costs are based on existing, proven technologies, not hopes of future advances or breakthroughs (as for clean coal, small scale nuclear fusion).
- Natural gas does not require subsidies. Unlike heavily subsidised renewable technologies, natural gas use allows countries to affordably reduce emissions.
- Natural gas generates jobs and growth. Natural gas can play a key role in sustainable economic growth.
- Natural gas creates synergies. Cooperation is the base of business relationships in the gas industry especially when different partners are involved in big gas projects. The gas industry also fosters good relations among countries. Natural gas finds consensus in society.

IGU intends to set up its own committee on gas advocacy to keep working on the topic.

At the end of the summit, Torstein Indrebø, the Secretary General of IGU encouraged all participants to be gas advocates and spread this mission to other stakeholders.

Marc Hall and Barbara Schmid of Bayerngas are respectively the Chairman and Secretary of Programme Committee E – Marketing.

TMK – 10 Years of High-Tech, Premium Business

The global pipe market has seen the rapid development of a specialised premium-class segment, which includes high-performance pipes, gas-tight threaded connections and field services for oil and gas operators working in unconventional environments.

▲ Ultra Premium Connection threading at the Odessa Ultra facility.

Whether in unconventional geological structures or demanding offshore conditions, as the requirements for oil and gas operators increase, so too does the need for premium grade products capable of withstanding today's challenging drilling environments.

In particular, pipes threaded with gas-tight connections provide additional durability and improved well integrity while making it possible to operate in the most severe and high-pressure conditions. Mirroring this trend, the world's leading pipe producers, including TMK, one of the three global market leaders, are actively developing premium-class products, which has led to the creation of a truly unique business segment.

▲ Pipes undergoing heat treatment at TMK's Baytown facility.

▼ OCTG pipes at TMK's Blytheville facility.

TMK has spent the last several years developing its premium segment and now offers a range of proprietary premium threaded connections. Prior to the development of TMK's premium portfolio, connections had to be imported on the Russian market. TMK's first breakthrough came with the TMK GF premium connection which was specifically designed for directional and horizontal wells. Nowadays, this connection is popular not only in Russia, but it also enjoys great success around the world. The TMK FMT premium threaded tubing connection has also proven itself as a reliable substitute to imported material.

Having strengthened its presence in the premium segment in Russia, Europe, the CIS and the Middle East, TMK entered the North American market, the world's largest pipe market, and established its American division with the acquisition of IPSCO's tubular assets. TMK IPSCO offers the ULTRA™ line of premium threaded connections, which are widely recognised as some of the strongest premium connections available for deep, high pressure, horizontal/directional, and other challenging environments, including shale deposits. Given their success, demand for ULTRA products has been rapidly increasing with eight of the top twelve operators working in such US shale plays as Barnett, Haynesville and Marcellus now using the ULTRA line of connections.

Although the industry has known about shale gas for decades, developing the technology to extract it safely and economically has posed a major challenge. The extreme depth, pressure and narrow pay zones of these shale plays are significant barriers that vertical drilling simply cannot overcome. However, advances in horizontal drilling, hydraulic fracturing and rising natural gas prices during the past several years have finally made recovery of unconventional shale gas resources financially viable. There are sufficient quantities of recoverable shale gas in North America – up to 3,842 tcf – to supply US natural gas needs for 45 years. Shale gas also may account for more than 30% of the technically recoverable gas reserves in the US. Finally, even with the recent decline in natural gas prices, advances in technology have allowed drilling in unconventional environments to remain economical.

Even with the advances in drilling technology and hydraulic fracturing, it has become apparent that there was tremendous need for a new breed of premium connections designed specifically to master the shale plays. The demand for equal

strength in both tension and compression, high torsion strength for rotation and superior sealing through metal-to-metal seals separated TMK IPSCO's ULTRA product line from every other type of premium connection on the market. The superior strength, performance and value of these products make them the leading premium connection choice of major and independent operators alike.

ULTRA Premium Connections have been produced in Odessa, Texas since 2004. They are also being produced currently at several other TMK IPSCO facilities – in Houston, Texas; Catoosa, Oklahoma and Brookfield, Ohio.

North American drilling activity and resulting pipe consumption continued its post-crisis recovery in 2010, buoyed by increased activity at onshore oil fields, a shift to wet natural gas drilling and the increasing complexity of unconventional drilling. In 2010, more than 295,000 joints containing ULTRA Premium Connections were produced at TMK IPSCO facilities in North America, which was a 36.5% increase over 2009.

As in the United States, shale drilling will likely be applied in Europe, which holds its own wealth of shale gas in regions such as Poland, northern Germany and the southern North Sea. Innovations such as ULTRA Premium Connections will be needed to access those resources.

In Russia, the potential use of premium connections in challenging environments remains strong with the implementation of offshore projects in the Caspian Sea, the continental shelf of Kamchatka and the Sea of Okhotsk, and the development of the Arctic.

Given these market prospects, TMK has been actively expanding its product range. In particular, TMK specialists have been developing the TMK PF, a new premium threaded connection comparable to other global market-leading premium connections. The Company will soon offer customers a double-flash welded drill pipe joint known as the TMK TDS, the gas-tight TMK CWB connection and the much anticipated DQX premium connection developed by TMK IPSCO.

Challenging drilling and operating environments call for specialised maintenance and repair services. Oil and gas operators need more than just pipe; they require the supply of the entire pipe column to the well site accompanied by related field services. To provide its customers with added value beyond premium connections, TMK has also positioned itself as an oilfield services company that supplies high-performance premium connections and the full range of support services including heat treatment, coating, threading, and technical support during running operations.

▲ The OCTG pipe storage area at TMK's Brookfield Ultra facility.

Today, TMK premium products benefit from the Company's extensive marketing network and enjoy a strong foothold in the North American, European, CIS, South-East Asian and Middle Eastern markets.

▲ OCTG pipes with Ultra Premium Connections ready for transportation from TMK's Odessa Ultra facility.

TMK (www.tmk-group.com)

TMK is a leading global manufacturer and supplier of steel pipes for the oil and gas industry, operating 24 production sites in the United States, Russia, Romania and Kazakhstan. Among global leaders, TMK has the largest steel pipe production capacity. The largest share in TMK's shipment structure belongs to high margin oil country tubular goods (OCTG). In 2010, TMK's pipe sales totalled approximately four million tonnes, shipped to customers in more than 65 countries.

TMK's ordinary shares are listed on Russia's MICEX and RTS stock exchanges. Its GDRs are traded on the London Stock Exchange, and its ADRs – on the OTCQX International Premier trading platform in the US.

How to Attract Students to the Gas Industry: The Naturgas Energía R&D Challenge

By Angel Mª Gutiérrez and Juan Ramón Arraibi

Naturgas Energía has launched a pilot project to attract talent to the gas industry by promoting gas R&D projects to high-level students through an Academic Focus Point (called Aula in Spanish) at the University of the Basque Country.

The problem: a shortage of skilled personnel

A shortage of talent is currently the most important issue facing the gas industry worldwide. Demand for skilled personnel has surpassed supply due to the rapid growth of new gas projects and markets. The ageing of existing staff, the retirement of many gas experts and the ever decreasing number of fresh professionals interested in the gas industry have heightened the problem.

The issue calls for a rapid industry response. Innovative solutions must urgently be found for the gas industry to sustain its growth and to ensure its continued safe operations. The challenge is to build strategic human capital to guarantee the future of the global industry throughout the value chain.

For this reason, the Malaysian Presidency of IGU set up Task Force 1 "Building Strategic Human Capital" for the 2009-2012 Triennium. Naturgas Energía represents the Spanish Gas Association (Sedigas) in this Task Force and has started to work on the Academic Focus Point as a possible solution.

The R&D challenge to attract talent

The Naturgas Energía proposal aims to attract the attention of university students and foster their interest in the gas industry by focusing on the company's R&D work.

A presentation of the natural gas industry R&D projects was made to all the final-year students of the Bilbao Engineering School.

For the pilot, Naturgas Energía proposed various R&D projects to be developed by students as an end-of-degree project. To this end an Academic Focus Point or "Aula" was set up for a hands-on experience within the School of Engineering in Bilbao that is part of the University of the Basque Country (Spain).

The main steps taken were as follows:

- A Framework Agreement with the University of the Basque Country was signed in December 2009.
- A Collaborative Agreement with the Bilbao Faculty of Engineering was signed in May 2010 to set up the Aula.
- The personnel responsible for the Aula were nominated: two people on behalf of the university and two people representing the gas industry.
- A public presentation of the natural gas industry R&D projects was made to all the final-year students of the Bilbao Engineering School in order for them to apply for the projects.
- The personnel responsible for the Aula selected the best candidates for each project.
- A kick-off meeting of the selected students and tutors was held before starting each project.

The personnel responsible for the Aula presented six project proposals and the following five projects led by high-level students have been developed during the academic year 2010/2011:

- Evaluation of the commercial technologies of upgrading biogas for grid distribution.
- Design of a small biogas plant of 10 m^3N per hour.
- Development of a computer model of a natural gas network capable of distributing mixtures of methane and hydrogen.
- Investigation of an experimental process to separate hydrogen by means of selective membranes.
- Development of a computer model to forecast natural gas demand in the domestic market.

The personnel responsible for the Naturgas Energía Academic Focus Point are (*from left to right*): Dr Gorozika and Dra Guemez (University of the Basque Country), Dr Arraibi and Dr Gutiérrez (Naturgas Energía).

Results of the Aula experience

The results of creating the Naturgas Energía Aula will be used as an example of best practice to be shared with the gas industry to:

- involve the best students of engineering in gas matters;
- create an additional workforce for R&D projects developed by the gas company;
- promote the general interest of university students in the gas sector; and
- help to create a good image of the gas industry in society by showcasing innovation.

These excellent results will be presented at the 25th World Gas Conference in Kuala Lumpur in June 2012.

In the meantime, it is important to highlight that a part of the small biogas plant Aula project was awarded third prize by the GERG Academic Network Event at the European Gas Technology Conference (EGATEC2011) held in Copenhagen in May.

Dr Angel Mª Gutiérrez and Dr Juan Ramón Arraibi of Naturgas Energía are members of Task Force 1.

Enabling a Better World

الشركة العمانية للغاز الطبيعي المسال ش.م.م
Oman LNG L.L.C.

The ongoing re-assessment of the merits and demerits of nuclear power has precipitated increased demand for other sources of energy including liquefied natural gas (LNG), the cleanest fossil fuel the world has at its disposal.

For some of the thirty-odd existing liquefaction plants around the world, the challenge centres more around accommodating new demand while maintaining reliable supply to long-term customers, rather than the expansion of their current capacities, simply because the search for additional quantities of energy has presented an urgent situation.

LNG companies that are thus able to strike the delicate balance between maintaining supply to long-term buyers and meeting new demand will play a determining role in shaping today's energy market.

In just over a decade of operations, Oman LNG has proven its versatility in the LNG industry, becoming an exemplar of a reliable supplier of LNG to customers and helping the world to meet the challenges of balancing supply and demand for liquefied natural gas, crucial for keeping many economies running.

The company, which operates a three-train (one is owned by Qalhat LNG), 10.4 metric tonne capacity project at the Omani city of Qalhat, Sur, produces and sells liquefied natural gas on a long-term basis to customers including Korea Gas Corporation (KOGAS) and Japan's Osaka Gas and ITOCHU, but has established Master Agreements with some thirty buyers, in different parts of the world, according to Adnan Rajab, Oman LNG's Vice President – Marketing.

"Oman LNG was one of the first companies to begin diversions in the LNG market and we are quick to take a decision when a window of opportunity for a diversion emerges," says Rajab.

An important factor supporting Oman LNG's reliability to customers has been the company's consistent investment in staff training and development over the years.

Such training ensures that employees, its most valuable assets, have a full understanding of the business, remain well-equipped and ever-prepared to face fresh challenges in a global industry that requires the very best hands in meeting its objectives.

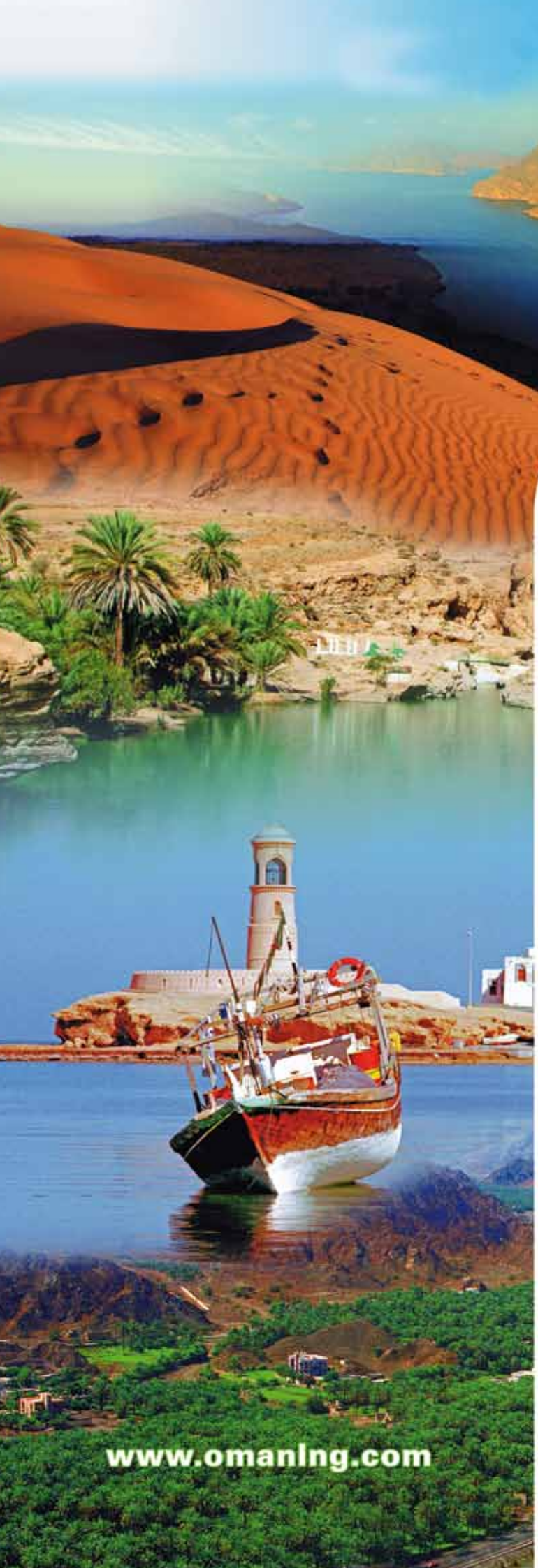
Also vital to Oman LNG's reliability has been the backing it receives from the Government of Oman.

With a 51% shareholding and as the gas supplier, the government's ability to meet its feedgas supply obligations has been a critical success factor in the company's operations.

Not surprisingly, Oman LNG remains a key driver in the government's bid to diversify the Sultanate's economy beyond its oil resources. Revenue from Oman LNG operations has contributed to the country's GDP, feeding industrialisation and expansion of the economy.

New oil and gas discoveries in Oman, announced in February signal a growth in the country's energy industry that will come as the Sultanate moves to tap these additional resources for domestic and international benefit.

And so for Oman LNG, a bright future beckons enabling it to serve its many buyers and continue providing a vital source of energy that helps to meet the world's growing industrialisation while preserving the earth's delicate environment for future generations to enjoy.



الشركة العمانية للغاز الطبيعي المسال ش.م.م

Oman LNG L.L.C.

A better world

With natural gas as the world's cleanest and most efficient fossil fuel, Oman LNG's operations at the Omani city of Sur, is helping to make for a better world.

Since starting production in 2000, we have delivered over a thousand cargoes to customers, remaining a reliable supplier of liquefied natural gas that is helping to reduce carbon emissions and preserve the earth's natural environment for future generations to enjoy.

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The Magic of the Future Generations

By Soh Mey Lee

Honouring and encouraging our young people is the focus of IGU's Task Force 2. These people, aged from five to 30, the next generation of the gas industry, are looking to us to recognise the quest they are on to discover who they are and what they can give to the world through meaningful careers, knowledge-building and sharing their skills with the industry and the world.

To remain relevant to young people, the global gas industry must respect the significance of this age group and not allow their passage from childhood to adulthood to slip by without any form of engagement with them.

"Nurturing the Future Generations" is a special project of the Malaysian Presidency of IGU for the 2009-2012 Triennium. The aim of the TF 2 project is to address specific issues on nurturing talent as an important first step in building strategic human capital to ensure the sustainability of the global gas industry.

We have already launched a social media website for young people interested in a career in gas, www.itsnotmagicitsscience.com. Members can click on a banner to play TAG – that is, to talk about gas.

It is now widely recognised that natural gas will be a critical part of the global energy solution as the fuel that leads to a cleaner energy future. To succeed, the global gas industry must innovate and innovation means the industry must attract, train and develop talented people.

Worldwide, however, there is fierce competition for talent and talent is in short supply. If the global

TF 2 launched a social media website for young people in April.

gas industry is serious about building strategic human capital and competing successfully for talent, innovative thinking is essential. The industry must be prepared to take a longer lead time to nurture talent to ensure there is a deep pipeline of qualified talents to achieve the industry's future objectives.

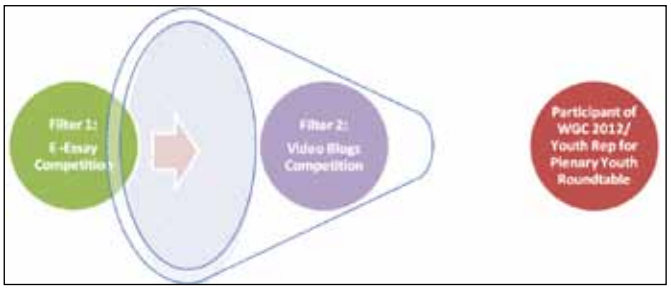
Developing talent is necessary to match the phenomenal pace of growth of the global gas industry, to meet the higher technical requirements of advanced technologies and to operate in tougher conditions. The global gas industry cannot just sit back and wait for the education system or academic institutions to deliver the talent we need. We need to recognise that this is a critical part of our workforce development investment and take preemptive measures to arrest any likely decline in the talent pipelines.

Nurturing talent is a big step forward for the global gas industry. This requires a serious convergence of effort and investment in time and money so, for the first time ever, IGU under the auspices of the Malaysian Presidency has introduced a youth component in its programme through the Task Force 2 project.

The TF 2 project consists of two major components. The first component is a strategy study to gain insights into the young generation's lifestyles, beliefs, values, interests and inclinations as regards STEM (science, technology, engineering and mathematics) education. The second component is a programme to engage young people globally at the 25th World Gas Conference to be held in Kuala Lumpur in June 2012.

Work the magic!

In the TF 2 project, young people are defined as those in the age group of five to 30 years. This means that young professionals fall into this category. In conjunction with WGC2012, the Task Force team has planned a number of events (*see table*) that will be organised by young people for young people. This is where your support and involvement to work the magic in them can make a huge difference.



The selection process for representatives to the Plenary Youth Roundtable.

Plenary Youth Roundtable Forum

Young people from around the world will have the opportunity to engage in an interactive plenary discussion with industry leaders on a wide spectrum of subjects pertaining to natural gas, the gas industry and their concerns and views with regard to STEM education, gas industry careers, energy, society and the environment.

The Plenary Youth Roundtable will see young people engaged with industry captains during a

LEFT
Table.

YOUTH EVENTS

A	**Key Youth Events at WGC2012, June 4-8, 2012**
1	Plenary Youth Roundtable Forum
2	Plenary Youth Video Recordings
3	WGC2012 Youth Conference and Carnival
4	WGC2012 Youth Night Out
5	WGC2012 Fun with Gas Carnival
B	**Pre-WGC2012 Youth Events and Build-up**
1	Social Networking website www.itsnotmagicitsscience.com (already live)
2	Science Action Team
3	Careers in Gas Forum
4	Educate the Educators
5	Natural Gas themed Science Show

A Hollywood-themed party will be a highlight of the Youth Programme at the 25th World Gas Conference.

1½ hour event at a Strategic Panel during WGC2012. In the interim, a screening of successful video entries of young people sharing their views and giving feedback to the industry will be featured.

The Youth Roundtable will be the highlight of the TF 2 project, although the website (which is already up and running), science shows and Youth Conference and Carnival all promise to be great ways to engage young people with the global gas industry.

Here's your chance!

This is an opportunity for talented young professionals, students and undergraduates to win a chance-of-a-lifetime opportunity to represent the younger generation globally at WGC2012.

Six to seven youth representatives from around the world will be selected through a three-stage selection process via online essay competitions, video submissions and phone interviews to test their eloquence and confidence.

The selected youth representatives will require sponsorship from companies or IGU members to attend. Here's the chance for your organisation to work the magic in them.

As a sponsor, your organisation will benefit from great exposure at WGC2012 in the programme book, a Youth Souvenir Programme book and at the high-profile event itself.

Youth Conference and Carnival

Complementing the events during WGC2012, a Youth Conference and Carnival will be held in an exclusive venue separate to the main conference and exhibition area.

An array of activities is planned for the four days of the conference, culminating in a Movie Magic night at one of Kuala Lumpur's hottest nightspots. The night event is for participating young people as well as conference delegates who can participate for a nominal fee.

The Movie Magic night promises a night of fun and glamour as everyone dresses up like their favourite movie stars and idols. Experience the night in the fashion "fab lane" and feel like a celebrity on the red carpet. Costumes will be made available or you can bring your own and get ready to win great prizes as you walk away as a Hollywood celebrity. Who knows? You may well become a real-life celebrity and find your way into the movies! Other fun activities for the night include face painting, henna art and tarot card and palm reading.

Your organisation can sponsor the Youth Conference and Carnival activities – it is a great opportunity to have a strong visual presence at the event. Contact us for sponsorship opportunities via the website www.itsnotmagicitsscience.com for more details.

Soh Mey Lee is the Chair of Task Force 2.

Chart Industries, Inc.

Chart Industries, Inc. is a leading global manufacturer of standard and custom engineered products and systems for a wide variety of cryogenic and heat transfer applications. Chart's equipment is used throughout the liquid gas supply chain in the production, storage and end use of natural gas and industrial gases.

Chart Energy & Chemicals, Inc., one of three Operating Groups of Chart Industries, focuses on providing "Concept to Reality" solutions for gas processing applications by combining Chart's pedigree in the design and manufacture of mission critical, proprietary cryogenic gas processing equipment including Brazed Aluminum Heat Exchangers, Cold Boxes and Air Cooled Heat Exchangers, with its patented process technology.

Significant development in the technology and economics of unconventional gas, particularly shale gas and the desire to extract the highly prized natural gas liquids is driving demand for Chart E&C's mission critical gas processing equipment whilst the exploitation of unconventional reserves also puts Chart's nitrogen rejection process technology center stage. Associated in-house design and fabrication experience spans 40 years and Chart's special talent in the provision of integrated systems that combine nitrogen rejection with natural gas liquids recovery that can also be extended to include adjunct systems for helium recovery and refrigeration grade nitrogen or high purity LNG, is particularly prized for the monetization of previously stranded gas reserves.

To find out more about Chart Energy & Chemicals visit www.chart-ec.com or scan the QR code in the advertisement below.

Developing Advanced Metering: The Ubiquitous Metering System

By Yasuhiro Fujii and Kenichiro Yuasa

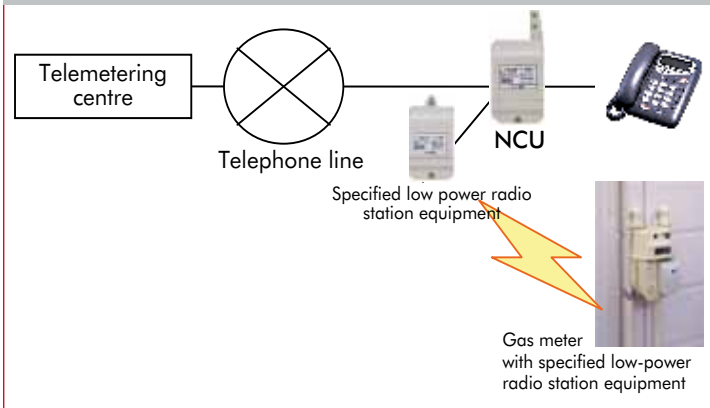
Strong demand is expected for smart meters that support the networking of sensor-equipped devices at home and improve security, and Japanese gas utilities have extensive experience in the field.

In 1983, they introduced Micom meters, which have a safety function to shut off the gas if abnormal use is detected or an earthquake occurs. In 1987, the utilities began to deploy meters with a communication interface. This makes advanced services widely available based on shared use of the customer's telephone line, such as safety monitoring, remote shutoff and automatic meter reading (AMR). Now work is underway on the next generation of advanced metering infrastructure (AMI).

This article summarises the current AMI and its restrictions, and describes the next generation of infrastructure being developed to address the future demand for smart metering technologies.

BELOW
Figure 1.

BASIC CONFIGURATION OF THE EXISTING AMI



Present-generation AMI

Basic configuration

Figure 1 shows the basic configuration of the current AMR system. Gas meters communicate with the telemetering centre through the shared use of the customer's fixed telephone line. The gas meter is connected to this line via an analogue communication modem called a network control unit (NCU). As fibre-optic and ADSL connections have spread, the telephone line junction point is no longer located at the telephone line lightning rod outside the building but at a modular jack (RJ-11, etc.) inside the building. In most cases, specified low-power radio station equipment provides a wireless connection between the telephone line and the gas meter.

The communication protocol for communication between the gas meter, NCU and specified low-power radio station equipment has been standardised by initiatives of the Japan Gas Association, which brings together the city gas utilities and the High Pressure Gas Safety Institute of Japan, an association of LPG suppliers.

A key feature of the present-generation AMI is a primary lithium battery in each terminal, which gives a service life of 10 years. In Japan, it is difficult to supply AC power to gas meters. Moreover, the Measurement Act of Japan stipulates that residential gas meters must be replaced every 10 years, which is regarded as the longest service life that can be certified. Therefore, each communication terminal is powered by a battery with the same replacement cycle as the gas meter to reduce operational costs.

Problems with the existing AMI

The existing AMI has two major problems.

Firstly, with the growing variety of fixed telephone lines, the sharp increase in the number of internet users and the expanding popularity of wireless broadband connections, it will become increasingly difficult to ensure stable metering services that rely on shared use with customers'

telephone lines. Even though mobile phone networks such as FOMA and PHS could be used as an alternative, these commercial wireless communication services have the following drawbacks:

- Rapid evolution of communication technologies leads to a wider variety and shorter life of communication infrastructure;
- They are more expensive than fixed telephone services; and
- With wireless communication methods, it is difficult to achieve a battery life of 10 years.

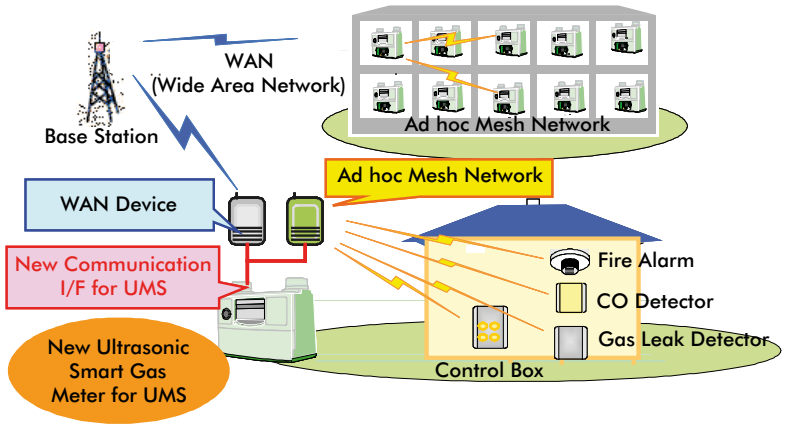
Secondly, a single-hop network configuration is used since the specified low-power radio station equipment used with the existing AMI is too slow in data transmission (2400 bps) for a multi-hop network configuration. However, there is an urgent need for the greater flexibility of a multi-hop wireless network and the capability of such a network to interact with various sensors. This is due to the growing number of mid-rise and high-rise condominiums with automatic entrance locks and of reinforced concrete buildings whose walls tend to block radio waves. There is also a growing demand for energy conservation support services and remote monitoring services for safety and security, which need to be supported by better technologies.

What is the ubiquitous metering system?

To address problems with the existing AMI, the major city gas utilities of Japan, the High Pressure Gas Safety Institute, communication service providers, wireless equipment manufacturers and meter manufacturers have discussed the specifications of the next-generation AMI, which is referred to as the Ubiquitous Metering System (UMS).

Figure 2 illustrates the UMS concept. It comprises: (1) Wide Area Network (WAN) devices; (2) ad hoc mesh networks; and (3) ultrasonic gas meters interfaced with a next-generation communication line (called U-Bus). The details of these are described below.

CONCEPT OF THE UBIQUITOUS METERING SYSTEM



ABOVE
Figure 2.

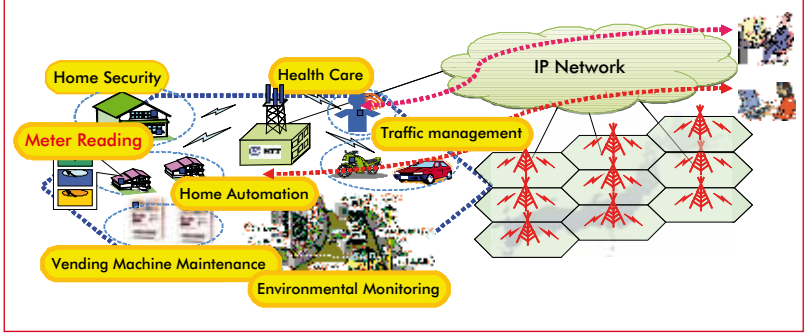
WAN devices

The most likely way to connect utilities with consumers would be via a Wide Area Ubiquitous Network (WAUN), which is currently being researched and developed at laboratories of the NTT Group. A WAUN (see *Figure 3*) has the following features:

- Wide coverage (a radius of several kilometres) by wireless communication in the UHF/VHF bands; and
- Optimised for low-volume communication over the network (several hundred bytes per terminal per month) for a low service fee and long battery life.

The network is now being tested in a Special Ubiquitous Zone in Tokyo, and an experiment to test the reach of radio waves confirmed 90% coverage of both indoor and outdoor areas.

WIDE AREA UBIQUITOUS NETWORK



BELOW
Figure 3.

SPECIFICATIONS AND FEATURES OF AD HOC MESH NETWORKS

Device	Frequency band	950 MHz (Japan) or other
	Standards	ARIB STD-T96 IEEE802.15.4g PHY (under standardisation process)
	Output power	10 mW/1 mW
	Data rate	100 kbps
	Life span	10 years
	Power supply	Lithium battery
Network	Network topology	Mesh structure
	Communication direction	Two-way
	Number of relays	Average: 5 hops, Max.: 15 hops
	Number of nodes	Max. 50
	Number of meters	Max. 50 (1/node)
Others	Routeing features	Automatic routeing, route diversity
	Network construction	Easy association with magnetic reed switch

ABOVE
Table 1.

Ad hoc mesh networks

Ad hoc mesh networks are short-distance wireless networks used for multi-hop relaying of metering data from gas meters outside the WAN service area to a WAN device.

They allow highly flexible multi-hop wireless communication with devices that consume little power. Data transfer by these networks is very reliable because the data are automatically rerouted if a wireless device fails or in the event of adverse conditions for the transmission of radio waves. Automated network configuration simplifies device installation. *Table 1* lists the specifications and features of ad hoc mesh networks.

Ad hoc mesh networks are now being field-tested, with some of the results as follows.

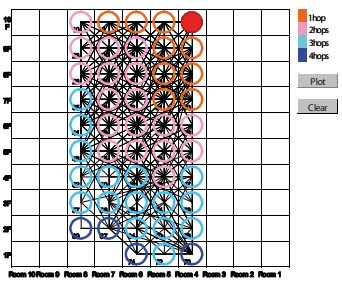
Figures 4 and 5 illustrate the results of field tests in which data communication was attempted after installing 48 ad hoc mesh network devices in the piping shaft compartments of different rooms in a 10-storey multi-household residential building.

Figure 4 shows the number of hops required to access each room at the time of communication from the terminal marked by the red circle to the terminals of each household. The graph on the left shows communication that required a maximum of four hops while that on the right shows communication that required a maximum of three hops.

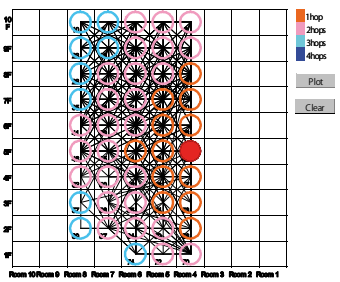
Figure 5 shows the routes for incoming data in red and outgoing data in blue. The route for outgoing data may differ from that for incoming data. The route for outgoing data shown on the right indicates a retry operation, where data returned to the original terminal and then were transmitted to another terminal. These test reports demonstrate the terminals' automatic rerouteing capability. This results in high reliability of data transmission because data are automatically rerouted if a wireless device fails or if there are adverse conditions for the transmission of radio waves.

BELOW
Figure 4.

FIELD TESTS OF AD HOC MESH NETWORKS – NUMBER OF HOPS REQUIRED



Test report – maximum of four hops



Test report – maximum of three hops

Ultrasonic meters interfaced with a next-generation communication line

Ultrasonic gas meters are electronic meters that measure flow using the propagation time difference method. Compared with conventional diaphragm meters, the size is about one-third and the weight is almost half, making these meters more compact and better looking. Moreover, with

LEFT
An ultrasonic gas meter.

greater communication compatibility and a more powerful CPU, they are capable of supporting new services and business-oriented uses.

Tokyo Gas Company, Osaka Gas Company and Toho Gas Company collaborated with meter and electronics manufacturers to develop these ultrasonic gas meters, and Tokyo Gas and Toho Gas started installing them in fiscal 2005.

Ultrasonic gas meters for the next-generation communication line (U-Bus) are now being developed. Major components include a pair of ultrasonic sensors, battery, controller, shutoff valve, pressure sensor and seismic sensor as shown in *Figure 6*.

The shutoff valve automatically shuts off the gas flow if an abnormal flow rate is detected or in the event of an earthquake. The shutoff valve is bi-directional and can be opened and closed remotely. The pressure sensor constantly monitors the gas supply pressure. The seismic sensor operates upon detecting seismic motions strong enough to cause furniture to fall over. *Table 2* lists the specifications of the ultrasonic gas meters.

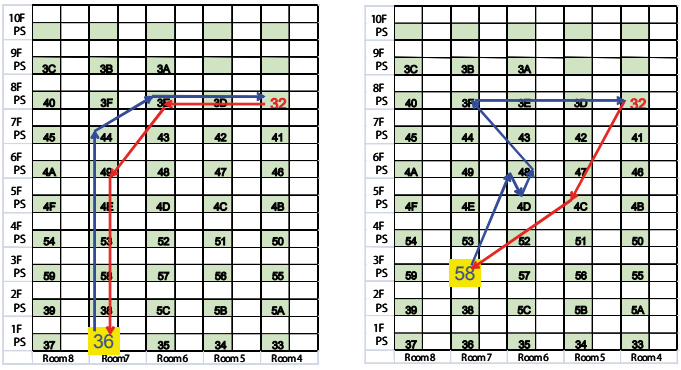
The U-Bus supports faster transmission of data than the standard communication interface specifications applied to conventional city gas metering devices. Moreover, the U-Bus supports

SPECIFICATIONS OF ULTRASONIC GAS METERS

Maximum flow rate	6 m^3/h
Minimum flow rate	25 L/h
Detectable minimum leak	3 L/h
Operating temperature	From -30 to 60 °C
Operating pressure	0–3.5 kPa
Shutoff valve	Open/close 2-way valve driven by stepping motor
Self-diagnostics functions	Low battery Ultrasonic sensor error Valve leakage
Logging function	Hourly gas consumption or gas pressure profile Up to 3 time zones per day for time-based multilevel tariff

LEFT
Table 2.

FIELD TESTS OF AD HOC MESH NETWORKS – DATA ROUTES

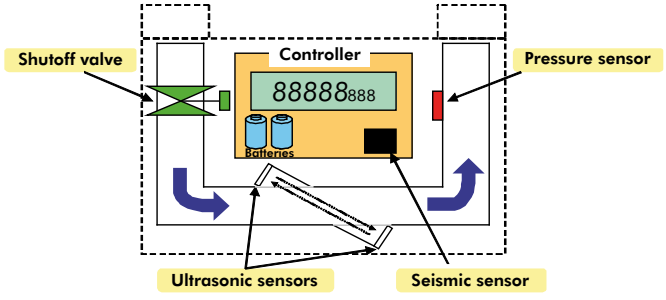


Test report

Test report – retry operation

ABOVE
Figure 5.

CONFIGURATION OF AN ULTRASONIC GAS METER



BELOW
Figure 6.

SPECIFICATIONS AND ADVANTAGES OF U-BUS

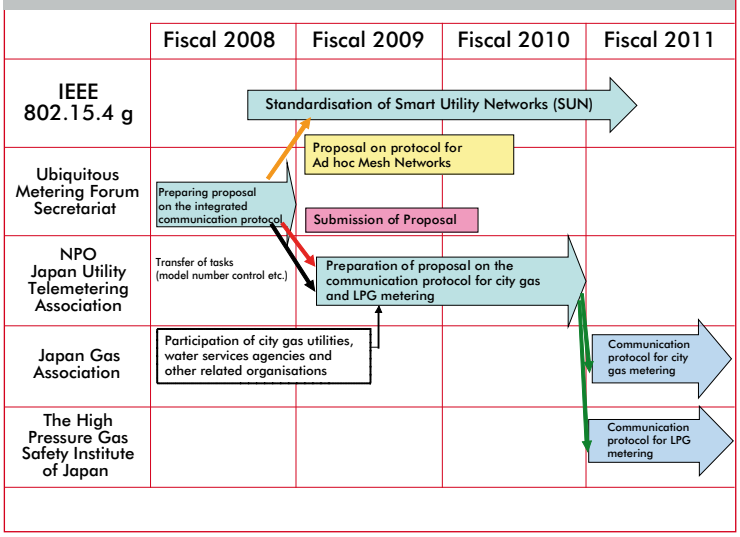
Layer	*Specification*	*Description*
Physical layer	Bus connection	Allows shared use of various devices.
	High transmission speed (9600 bps)	Wider application and higher service level as a result of high-speed transmission (approx. 30 times faster than the current device).
Data link layer	Packet communication	Improved bi-directional communication between terminals with different transmission speeds; More efficient use of communication links; Improved resistance against faults.
	Fixed packet length (104 characters per packet)	Improved efficiency of data processing by terminals; Faster response (0.12s with each packet).
Network layer	Gateway function added to the meter	Supports addressing in wide area networks and relayed wireless networks.
	Simplified addressing	Simplified terminal installation.
Security	Encryption as a standard	Improved access control and security protection.

RIGHT
Table 3.

packet communication. These highly versatile specifications support diverse configurations of WANs and Personal Area Networks with wireless WAN devices, ad hoc mesh network devices, etc. Since devices with the same communication interface can communicate over the bus, the U-Bus will enable new services such as the control of appliances. *Table 3 (over)* lists the specifications and advantages of U-Bus.

BELOW
Figure 7.

PROGRESS OF STANDARDISATION EFFORTS



● Standardisation

Various efforts are being made to standardise technical specifications for the UMS. *Figure 7* illustrates the progress of these efforts.

For some parts of the physical and media access control (MAC) layer specifications of ad hoc mesh networks, technical proposals for global standardisation have been submitted to the IEEE 802.15.4g/e working groups.

● Conclusions

The technical specifications of the UMS have now been established, and corresponding devices are now being developed and field-tested in readiness for mass production. The UMS is expected to be an excellent next-generation AMI to meet various demands in the utility sector.

Yasuhiro Fujii of Osaka Gas and Kenichiro Yuasa of Tokyo Gas are members of Working Committee 4 – Distribution.

The EDF Group, one of the leaders in the energy market in Europe, is an integrated energy company active in all businesses: generation, transmission, energy supply and trading. The Group is the leading electricity producer in Europe. In France, it has mainly nuclear and hydroelectric production facilities where 95% of the electricity output involves no CO_2 emissions. The Group is involved in supplying energy and services to around 38 million customers around the world.

EDF operates in the natural gas end-market through EDF SA (France), EDF Energy (UK), EnBW (Germany), Edison (Italy), and SPE (Belgium), and also through EDF Trading, particularly in the wholesale natural gas market. EDF plans to continue expanding its natural gas businesses in France and across Europe. In 2009, the Group's gas use for power generation and customer sales was close to 30 bcm.

Our existing LNG operations include the medium-term (4.5 years) LNG supply contract between EDF Trading and RasGas for deliveries into Zeebrugge of up to 4.5 bcm and the Edison co-sponsored Rovigo offshore re-gasification terminal in the Adriatic sea, which started operations toward the end of 2009 and for which Edison secured sourcing of 6.4 bcm/yr of LNG from Qatar. New LNG developments include our re-gasification terminal project in Dunkirk, France (up to 13 bcm/yr capacity), which targets operational start-up by 2014.

EDF, through its subsidiary EDF Production UK, also owns gas production assets in the British North Sea; at the end of 2009 the gas reserves were estimated at 2.8 bcm. In Germany EDF and EnBW pursue the joint development of their storage project in salt caverns at Etzel for a volume of approximately 0.4 bcm.

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LEADING THE ENERGY CHANGE

Presenting IGU's New Associate Members

New members of IGU are invited to contribute a profile of their organisations to the IGU Magazine. In the last issue we featured the latest Charter Member from Mexico and now it is the turn of the new Associate Members. Here we have contributions from Origin Energy and RWE Deutschland.

Origin Energy

Origin is the leading Australian integrated energy company, focused on gas exploration and production, power generation and energy retailing.

Originally listed on the Australian Securities Exchange (ASX) in February 2000, Origin has grown from a market capitalisation of around A$600 million to more than A$16.4 billion ($17.6 billion) in just over a decade. During that time, Origin has been one of the top performing companies on the ASX, and today is listed in the top 20 companies. In the 2010 financial year, Origin had annual revenue of more than A$8 billion ($8.6 billion).

Origin has extensive operations throughout Australia and New Zealand, and is also pursuing a range of opportunities in the fast growing energy markets of Asia.

With its operations increasingly expanding internationally, Origin joined IGU to participate in IGU's global energy network.

Origin's interests include the Kupe field in New Zealand (ABOVE) Kupe's onshore gas processing plant and Australia Pacific LNG (OPPOSITE) the Spring Gully CSG plant in Queensland.

Our business

As an integrated energy company, Origin has diverse operations spanning across the energy supply chain. The company holds leading market positions in gas, power generation and retail.

Exploration and Production

Origin's Exploration and Production business targets new gas reserves which can be quickly developed and connected to key markets. The company operates several offshore exploration permits in Australia, New Zealand and throughout Asia and has a strong portfolio of onshore gas producing facilities.

Origin's exploration portfolio includes interests in the Bowen, Surat and Cooper/Eromanga basins in Central Australia, the Otway and Bass basins in Southern Australia, as well as interests in the Perth Basin in Western Australia and the Bonaparte Basin in the Northern Territory. We also have exploration projects located in New Zealand in the Taranaki, Northland and Canterbury basins, as well as in Lao PDR, Thailand, Kenya and Vietnam.

Australia Pacific LNG

Through Australia Pacific LNG, Origin's joint venture with ConocoPhillips and Sinopec, Origin is developing one of Australia's largest coal-bed methane (known as coal-seam gas – CSG in Australia) to LNG projects. Australia Pacific LNG holds Australia's largest 2P CSG reserves, is the country's leading producer of CSG, and is proposing to build an LNG facility at Curtis Island in Gladstone, Queensland, which would be one of Australia's largest LNG export projects.

Generation

Origin has one of Australia's largest and most flexible generation portfolios with more than 5,930 MW of capacity, through either owned

or contracted generation[1]. Origin is also the largest owner and developer of gas-fired power generation in Australia, operating eight power stations across New South Wales, Queensland, South Australia and Victoria.

In recent years, Origin has significantly grown its generation portfolio through the completion of new developments and securing contracting arrangements. The 630 MW Darling Downs power station in Queensland became operational in 2010 and is Australia's largest combined-cycle gas turbine power station. It is also one of the country's cleanest, in terms of carbon emissions. The 550 MW gas-fired Mortlake power station in Victoria is currently undergoing commissioning and is expected to begin commercial operations early in the 2012 financial year.

Origin is a significant investor in renewable energy technologies including wind, solar, geothermal and hydro. The company operates the 30 MW Cullerin Range wind farm in New South Wales.

1 Includes Mortlake power station, currently under construction, and 2,800 MW from Eraring power station (contract capacity upon completion of upgrades).

RWE Deutschland's operating principles are based on providing a secure, reliable energy supply day and night.

Retail

With 4.6 million electricity, natural gas and LPG customer accounts, Origin is Australia's largest energy retailer.

Working sustainably

Origin has a strong focus on ensuring the sustainability of its operations, is headquartered in Sydney, Australia and employs more than 4,700 people.

The company has a long history of working alongside communities in rural and regional Australia, and values a constructive relationship with local communities, landowners and all levels of government.

More information is available at www.originenergy.com.au.

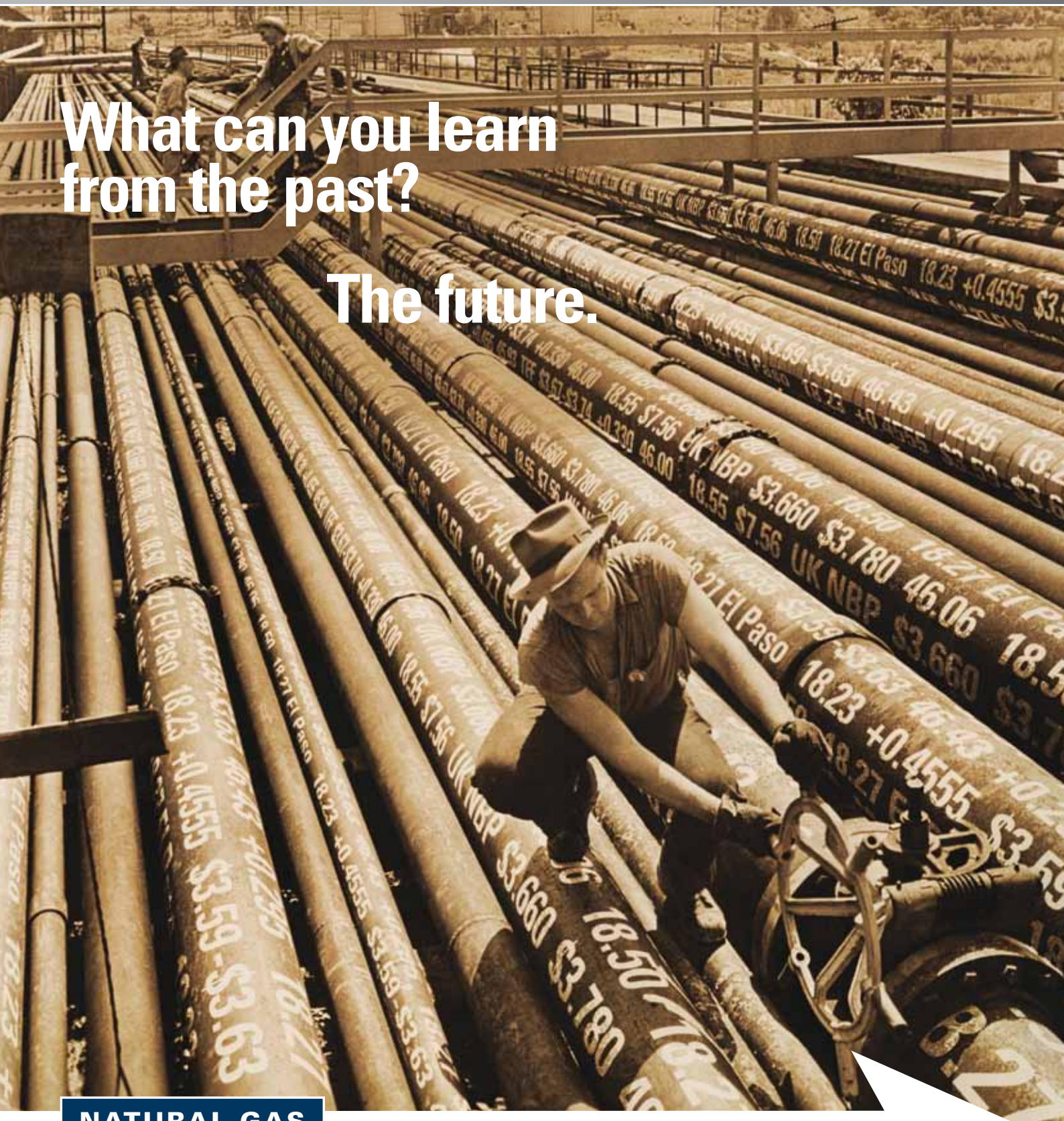
RWE Deutschland

RWE Deutschland is part of the RWE Group, a leading European supplier of gas, electricity and water which also has upstream gas interests. The entire RWE Group generated €53 billion ($76 billion) in revenue in 2010, producing 3 bcm of gas and supplying eight million gas customers.

RWE Deutschland is an operating parent company which oversees six regional energy companies as well as distribution grids, grid servicing, gas storage and metering in Germany. It employs more than 21,000 people and 2010 sales revenue was €18.5 billion ($27 billion). The company also forms partnerships with German municipalities – it has eight majority participations in municipal utilities and more than 70 minority participations. Business and residential customers are supplied with gas, electricity, water and services as well as energy efficiency consultancy and development schemes. It has gas storage capacity of 1.5 bcm, which is equivalent to the annual consumption of 600,000 households.

RWE Deutschland's operating principles are based on providing a secure, reliable energy supply day and night and ensuring security complies with international standards. The company is steadily investing in the expansion and maintenance of gas, electricity and water grids and has been driving the development of new technologies, in particular environmentally friendly electricity storage solutions. RWE Deutschland is also committed to developing an electronic energy marketplace by participating in a project called EDeMa (from the German initials) which cross-links end users, energy traders and grid operators.

More information is available at www.rwe.com.



NATURAL GAS

No one offers more historical natural gas data than Platts, the energy industry's pricing data and information resource for over 100 years and counting.

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www.PlattsHasTheData.com

Publications and Documents Available from IGU

As a non-commercial organisation promoting technical and economic progress in the gas industry worldwide, IGU offers its publications free of charge. You are invited to download the publications currently available from the IGU website www.igu.org or order hard copies from the Secretariat.

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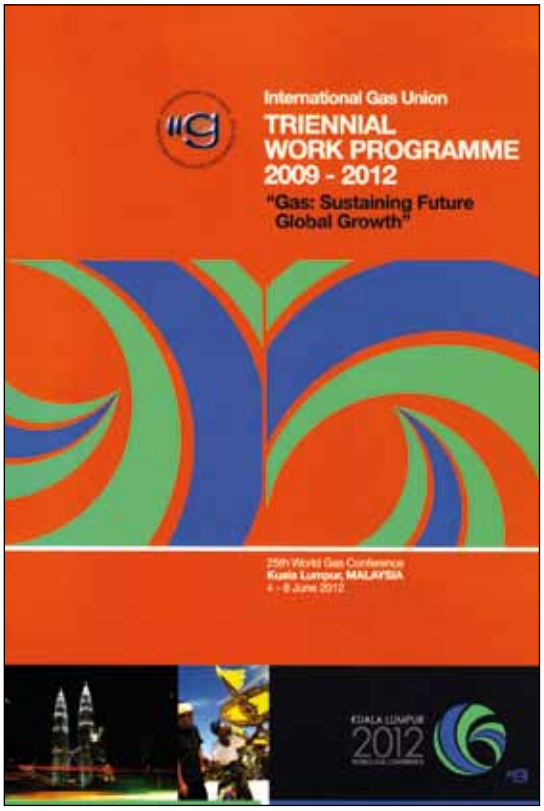
IGU publications

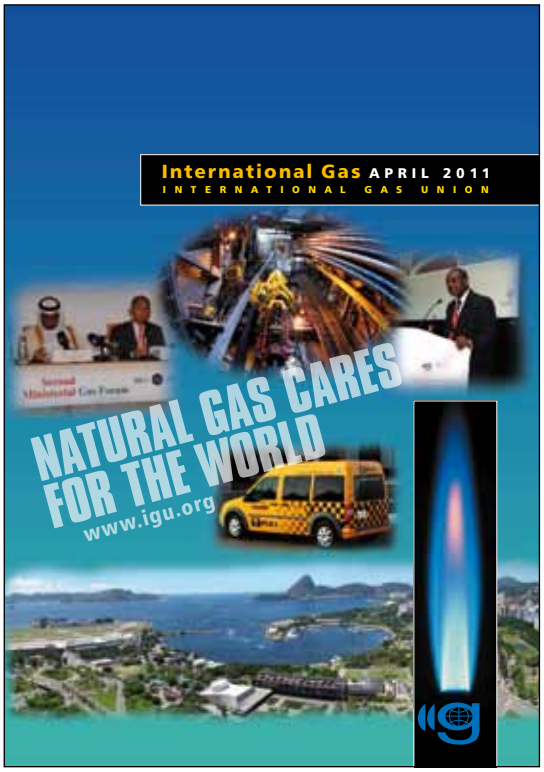
- IGU Articles of Association
- IGU Annual Report
- IGU Strategic Statement
- IGU General Brochure
- IGU Organisation Chart 2009-2012
- Triennial Work Programme 2009-2012

- IGU Gas Efficiency Award 2008/2009 & IGU Social Gas Award
- IGU Guiding Principles for Sustainable Development
- Natural Gas – Part of the Solution to Global Climate Changes
- Natural Gas as a Transportation Fuel
- Natural Gas Unlocking the Low-Carbon Future
- World LNG Report 2010
- Wholesale Gas Price Formation – A Global Review of Drivers and Regional Trends

Publications from WGC2009

- Natural Gas Industry Study to 2030
- IGU Energy Efficiency Indicators
- IGU Proposed Guidelines for Gas Market Integration
- Best Practices Initiative
- Proceedings of the 24th World Gas Conference, Buenos Aires 2009





Joint publications with other organisations

- The Role of Natural Gas in a Sustainable Energy Market (with Eurogas)
- Guidebook to Gas Interchangeability and Gas Quality 2010 (with BP)

Scientific and technical papers and documentation

- Proceedings of the 23rd World Gas Conference, Amsterdam 2006, (CD-ROM)
- Sustainable Development and the Role of Gas (2006)
- Gas to Power Global Outlook, (2006)
- The Art of Regulation, (2006)
- Proceedings of the 22nd World Gas Conference, Tokyo 2003
- Proceedings of the 17th, 18th 19th, 20th and 21st World Gas Conferences, (CD-ROM)
- International Gas, ISC, all issues of the bi-annual IGU Magazine from 2004-2011

Please check the IGU website for other (older) publications which are still available from the IGU Secretariat.

IGU Events and IGU-related Events 2011-2012

2011

October 3-7
IGU Council Meeting
Dubrovnik, Croatia

October 18-20
4th Biennial Conference & Exhibition of the Asia-Pacific NGV Association (ANGVA2011)
Beijing, China

October 19-21
IGU Research Conference (IGRC2011)
Seoul, Korea

October 31-November 2
Australia Gas
Sydney, Australia

November 7-11
World Shale Gas Conference & Exhibition
Houston, USA

November 28-December 9
17th Session of the Conference of the Parties to the UNFCCC (COP17)
Durban, South Africa

December 4
IGU Gas Symposium
Durban, South Africa

December 4-8
20th World Petroleum Congress
Doha, Qatar

2012

March 13-15
IGU Executive Committee
Houston, USA

June 4
IGU Council Meeting
Kuala Lumpur, Malaysia

June 4-8
25th World Gas Conference
Kuala Lumpur, Malaysia

October 8-11
Gastech 2012 Conference & Exhibition
London, UK

October 9-11
13th Biennial NGV Global Conference & Exhibition (NGV2012)
Chuncheon, Korea

You can find links to many of the above events by visiting www.igu.org.

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Cover: flame – David Parker/Science Photo Library; the UK's National Science, Technology, Engineering and Mathematics Centre – National STEM Centre; chassis of a CNG-fuelled Opel Zafira – GM Corp; view of Dubrovnik – Dubrovnik Tourist Board; Pearl GTL – Royal Dutch Shell.

Messages: Malaysian Gas Association – MGA (10), IGU (14), IEA (14), Nord Stream (15).

IGU Members and Organisation: Statoil (22), IGU (26), MGA (Datuk Abdul Rahim Hj Hashim and Ho Sook Wah, 27), AFG (Jérôme Ferrier and Georges Liens), IAPG (Ernesto López Anadón, 27), IGU (Torstein Indrebø, 27).

News from the Secretariat: All IGU except Steinar Arneson/G21 (34 upper).

Reports from the Regional Coordinators: IGU (42), Hong Kong and China Gas Company Limited (43), NV Nederlandse Gasunie (44), IBP (45).

News from Organisations Affiliated to IGU: Danish Gas Technology Centre (48, 49, 50 & 51), GERG (54), EDI (56 & 57), GTI (60 & 62), IPLOCA (64), Eni S.p.A (68), Waste Management (69).

Countdown to the 25th World Gas Conference: MGA.

Progress Report: All IGU except MGA (80 upper two pictures), Flickr User: Rodrigo Soldon (80 lower).

The Croatian Gas Industry: INA (138, 139 lower & 140), Dubrovnik Tourist Board (139 upper), FGSZ Ltd (142), Goran Kekic/ZET (143).

Reducing Gas Flaring Under the Clean Development Mechanism: Gazprom (146), Ed Kashi (149).

Efforts to Reduce Methane Emissions in UGS Operations: Storengy (152), Photocentre GDF SUEZ/Interlinks Image Antonin Borgeaud (153).

International Pipeline Update: Yan Ping/XinHua/Xinhua Press/Corbis (156), Nabucco International Gas Pipeline GmbH (157), Nord Stream AG (158), Andrew Wong/Getty Images/Rolls-Royce plc (162), AP/Press Association Images (163).

Best Practices in Pipeline Integrity Management: Petronas Gas Berhad.

A Very Unconventional Gas Field: Eawag – aquatic research (176 & 179), Adrian Giddings (177 upper), ONE www.one.org (177 lower), Hans-Erik Nobel (178).

The Asian Gas Market: Adrian Giddings (183), PTT Public Company Ltd (184).

The Great East Japan Earthquake and its Effect on Japan's Energy Policy: Gas Energy News, Japan (190, 191, 193 & 194), US Navy photo/Mass Communication Specialist 3rd Class Dylan McCord (192), Air Photo Service (195).

The First ICER-IGU Workshop: IGU.

Marketing Initiatives for Promoting Gas in a Low-Carbon Economy: IGU.

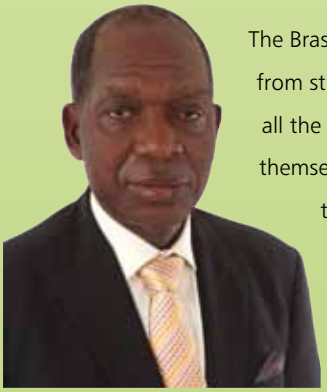
How to Attract Students to the Gas Industry: Naturgas Energía.

The Magic of the Future Generations: IGU (212 & 213), Alan Light (214).

Developing Advanced Metering: Tokyo Gas.

Presenting IGU's New Associate Members: Origin Energy (222 & 223), RWE (224).

A Message from the Chairman of Brass LNG



Dr Jackson E Gaius-Obaseki

The Brass LNG project continues to go from strength to strength, addressing all the challenges that present themselves, and I am pleased to have this opportunity to highlight some significant recent events as we move toward the signing of the Final Investment Decision (FID).

Gas supply issues, which have been a challenge for the last 15 months, have been resolved and the projected volumes of LNG to be produced have been allocated to prospective buyers. The Brass LNG sales portfolio has been revised, ensuring improved value and project viability and with the integration of the Nigerian National Petroleum Corporation (NNPC) as a potential stand-alone gas supplier and LNG buyer the nation stands to receive increased benefit from the project. We have also begun the process of admitting strategic investors to join the company.

We have issued invitation to tender packages for Brass LNG's four major EPC contracts and, on the shipping side, invitations have been issued for contracts relating to shipyards and ship owner-operators. In relation to these contracts we have organised workshops which have informed approximately 500 local businesses of the opportunities that are available to them through the Brass LNG project.

We have engaged our host communities through a number of sustainable development initiatives including the renovation of the Okpoama cottage hospital, the initiation of a micro-credit scheme for 120 local women (with an over 90% repayment rate) and have provided development training for 412 local contractors and suppliers to enable them to maximise the business opportunities that Brass LNG will bring to the area. The Brass Island information centre is also nearing completion.

Additionally, upon conclusion of the due diligence process, the proposed integration of the NNPC joint venture (Nikorma) into the Brass LNG shipping acquisition is being addressed. This will expand LNG shipping capability in-country as well as attract additional value from this niche sector.

In advance of the FID the Board has approved engineering works to be commenced by Bechtel covering early engineering, geophysical and geotechnical investigations relating to the gas trains and these will streamline the scheduling of the various EPC contracts mentioned above. Seven critical support contracts are also being finalised relating to areas such as security, air operations environmental monitoring and so forth.

Last year saw a major industry milestone in the enactment of the Nigerian Oil and Gas Industry Content Development Act, 2010. Our company's commitment to Nigerian content preceded the passage of this Act and has seen 125 technicians trained at PTI Warri since 2005. All stakeholders in Brass LNG are very focussed on the early delivery of the project FID in order to accelerate the realisation of the Federal Government's developmental and value creation objectives for the project. FID may now be well within our reach by the end of 2011.

I would like to take this opportunity to commend the management and staff of the company for their faith in the success of the project as displayed in their hard work and dedication. I also continue to express my heartfelt gratitude to the Federal Government of Nigeria as well as to the Bayelsa State Government for their long-standing commitment to the Brass LNG project. The President of Federal Republic of Nigeria and the Honourable Minister of Petroleum have also continued to display their support and commitment to the project's success. We also have massive support and goodwill from our host communities as evidenced by the peaceful and secure atmosphere at the project site and complete lack of any security concerns for the life of the project so far.

I share in the conviction of the management, board, staff and shareholders that the Brass LNG project will soon be delivered both profitably and sustainably.

Dr Jackson E Gaius-Obaseki, CON. JP,
Chairman of the Board of Directors,
Brass LNG.

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