

International Gas

April – September 2013

A MARKET IN EVOLUTION

New growth phase for LNG business



INTERNATIONAL GAS UNION
UNION INTERNATIONALE DU GAZ

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We focus on collective efforts to do things differently by continuously challenging industry norms to achieve real, sustainable and long-term growth.

Guided by this bold commitment, we constantly strive for new solutions and push boundaries to stay ahead.

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GE imagination at work

International Gas

APRIL – SEPTEMBER 2013

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in conjunction with the International Gas Union (IGU).

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Vision, Mission and Objectives

The International Gas Union (IGU) is a world-wide, 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.

Vision

IGU shall be the most influential, effective and independent non-profit organisation serving as the spokesperson for the gas industry worldwide.

Mission

- ◆ IGU will advocate for natural gas as an integral part of a sustainable global energy system.
- ◆ IGU will promote the political, technical and economic progress of the global gas industry, directly and through its members and in collaboration with other multilateral organisations.
- ◆ IGU will work to improve the competitiveness of gas in the world energy markets by promoting the development and application of new technologies and best practices, while emphasising sound environmental performance, safety and efficiency across the entire value chain.
- ◆ IGU will support and facilitate the global transfer of technology and know-how.
- ◆ IGU will maximise the value of its services to members and other stakeholders.

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, policymakers 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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of customers
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natural gas

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Energy and economic growth for the world.

Global energy demand is expected to be about 30 percent higher in the year 2040 than it was in 2010. Natural gas will play an increasingly important role in meeting this growing demand, while at the same time helping power economic growth and improving living standards.

A rising share of global natural gas demand will likely be met by unconventional gas supplies, such as those produced from shale and other rock formations.

So whether it's exploring for or producing new energy supplies, delivering innovative petroleum products or investing in communities, ExxonMobil is developing more than oil and gas—we are helping to support the future.

Learn more about our work at exxonmobil.com

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Taking on the world's toughest energy challenges.™

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The opinions and views expressed by the authors in this magazine are not necessarily those of IGU, its members or the publisher. While every care has been taken in the preparation of this magazine, they are not responsible for the authors' opinions or for any inaccuracies in the articles.

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



Bringing energy to life

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the world is their playground.
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the power of the drop
THE ENERGY TO TRANSFORM

Message from the President

Dear Colleagues

A few months after having been entrusted by the Union with the responsibility to promote the gas industry on a global basis during the 2012-2015 Triennium, I am feeling that, if I may paraphrase President Kennedy, we should not ask what governments, international agencies and policymakers can do for our industry but what our industry can do for the people.

It is indeed an exciting and challenging role to advocate the development of natural gas, not only as a destination fuel, but also as a key long-term solution for sustainable economic growth and a more secure energy future for most people, and in all regions.

The future, as we see it, should be environmentally friendly for the air, water and landscape, job creating, highly innovative and offer to customers all the benefits that they can expect in the internet era.

We have to place gas in the hearts, as well as in the minds of everyone and advocate on the basis of tangible facts and figures that can be easily understood, conveyed and promoted across the board. For instance, when addressing the issue of substituting coal for natural gas in power generation, we should demonstrate that we act in favour of climate mitigation and the environment on two fronts: air quality, of course, but also the use of precious water, which is reduced by between 60% and 100% with combined-cycle gas turbine (CCGT) and cogeneration technologies.

I am therefore convinced that natural gas should be associated not only with competitiveness but also with innovation.



We should not leave the promotion of innovative solutions to the field of renewables, but work actively to enhance the role of gas in ensuring the integration of different energy and transportation systems through a series of active interfaces. We need to work with the electricity network on the storage of hydrogen to optimise the use of renewable capacities, with the road transport sector to encourage the use of heavy-duty natural gas vehicles (NGVs) and in the residential sector to develop micro-cogeneration and fuel cells.

To this end, we have prioritised our actions in 2013 in three directions, aiming respectively at:

- ◆ Promoting at the political level, the “gas + renewable” paradigm as the best option for meeting the climate imperative in the most affordable conditions. Earlier this year, I led an IGU delegation to meet the Director

► Jérôme Ferrier,
President.

General for Energy of the European Commission, Mr Philip Lowe. Our meeting allowed us to propose a more active contribution of IGU in following-up the EU 2020 and 2050 roadmaps and to express our concern about the surge of coal in the electricity generation mix, which is making it more difficult to achieve the environmental targets set by the Commission;

- ◆ Enhancing the capacity of IGU to work in full synergy with international institutions, offering our assistance and the experience of our members as regards the best technical, regulatory and contractual practices for using natural gas to foster the development of emerging countries. Our initial discussions with Dr Kandeh K. Yumkella, UNIDO Director General, have opened avenues for cooperation with IGU on the programme “Sustainable Energy for All”, placed under his authority. We have also met UNESCO representatives to explore cooperation between this institution, IGU’s Task Force 2 and our promising Youth Programme;

- ◆ Gathering feedback from members on their experiences and successful projects, which could be used for the benefit of other members. The invitations that have been kindly extended to me over the past months to address GASEX in Jakarta, the General Assembly of GIIGNL in Madrid, the Czech Gas Association in Ostrava, the Latin American Shale Gas Summit in Buenos Aires, Gas of Russia in Moscow and the Algerian Gas Industry Association’s symposium in Algiers, have convinced me of the strong desire for cooperation among our members and of the merits of our internal networking.

On the occasion of this spring edition of the IGU Magazine, I wish our members every success in their activities in the service of the gas industry and assure you of my full dedication to maintaining the effectiveness and standing of IGU.



Jérôme Ferrier



◆ Gas-fired cogeneration plants like this one in Ludwigshafen, Germany offer major energy efficiency and environmental benefits.

Developing expertise

By combining R&D and
technological boldness



To secure the future of energy, Total has identified the following challenges for its R&D operations: to more effectively develop and process resources, to drive faster growth in alternative energies, to optimize the efficiency of the industrial base, to design innovative products, to address environmental issues and to fast-track the introduction of advanced technologies across the business base. We intend to invest €7 billion in R&D over the period 2010-2015. Thanks to recent advances in geological concepts and technology, for example, major oil and gas finds are now possible in places that not so very long ago would have been unexpected or inaccessible.

www.total.com



Our energy is your energy

Message from the Secretary General

Dear Reader

Energy markets are changing constantly and this influences both IGU and its members. Our gas industry has a long-term investment outlook with infrastructure lifetimes of several decades, yet we need to operate efficiently in the short-term to meet rapidly changing requirements. Strategies therefore need to be robust and adapted to changing political and commercial realities.

At present there is a particular focus on the following issues:

- ◆ What impact will North America have as an LNG exporter a few years from now?
- ◆ Will the shale gas revolution in the US occur in other countries?
- ◆ Are current regional gas price differentials sustainable?

- ◆ What will be the role of nuclear power after Fukushima?
- ◆ How will China's gas demand growth be supplied?

These matters, along with the global economic situation, were raised and debated first during the Executive Committee and Council meetings in Ottawa, Canada in October 2012 and later on November 16, 2012 at the 3rd IEF-IGU Ministerial Gas Forum in Paris. The Forum gathered political leaders and policy-makers from all over the world.

An important take-away from both these events is that there is a huge need for dialogue and communication not only with policymakers, but also with stakeholders outside our industry and with the general public. We need to listen carefully to local and regional concerns, and then adapt and strengthen our gas advocacy

▶ Torstein Indrebø,
Secretary General.





efforts. Globally there is evidence that our message is getting through, with its cleaner and environmentally friendly properties enabling natural gas to grow its global market share faster than coal for the first time in many years. Reports on the Council meeting and the Forum can be found in this issue of the magazine.

The Council meeting in Canada also approved Albania, Azerbaijan, Colombia and Côte d'Ivoire as new Charter Members and Repsol as a new Associate Member. It is very gratifying that more countries and organisations are applying to join IGU. This strengthens our role as a spokesperson for the gas industry and global centre for expertise and network building.

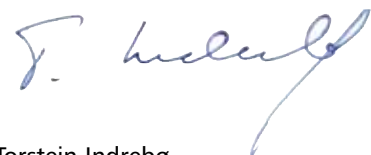
There is an increasing need for competence on how to develop new gas markets successfully. A central aspect of IGU's mission is to contribute to transferring expertise and experience globally. Many countries that are seeking economic, secure and environmentally friendly energy solutions now want to increase the share of gas in their portfolios. "Sustainable Energy for All" is a United Nations (UN) initiative and the UN wants to collaborate with IGU to accelerate the development of expertise and investments in the energy infrastructure of developing countries.

▲ "Sustainable Energy for All" is an initiative launched by UN Secretary General Ban Ki-moon (centre) and guided by his high-level group.

▼ Delphine Batho, French Minister of Ecology, Sustainable Development & Energy and Jérôme Ferrier, IGU President at the 3rd IEF-IGU Ministerial Gas Forum.

Many of us will meet in Houston in April to take part in LNG 17, the largest and most important gas event of 2013 and one of the IGU's flagship arenas for exchanging information and opinions. Our colleagues in the American Gas Association have prepared an exciting programme which I hope many people will have the opportunity to experience.

Enjoy your reading!



Torstein Indrebø





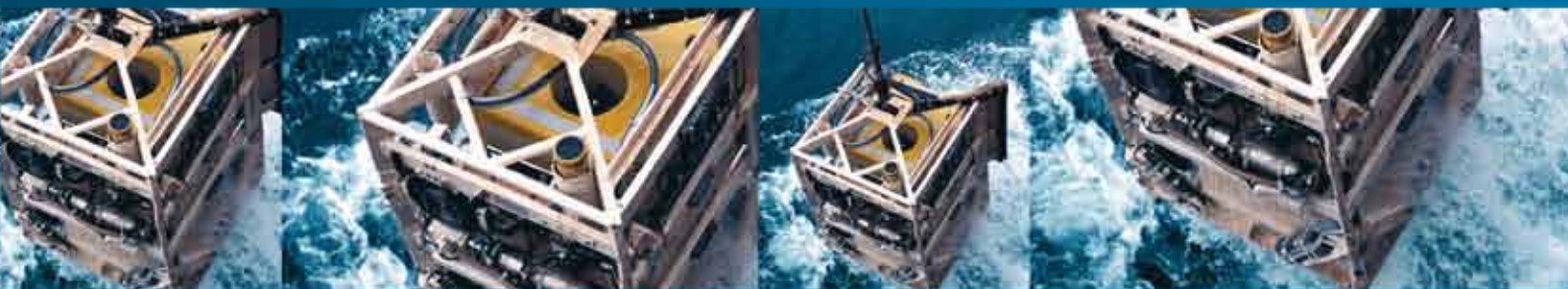
In order to get here, we followed the most rigorous safety rules



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



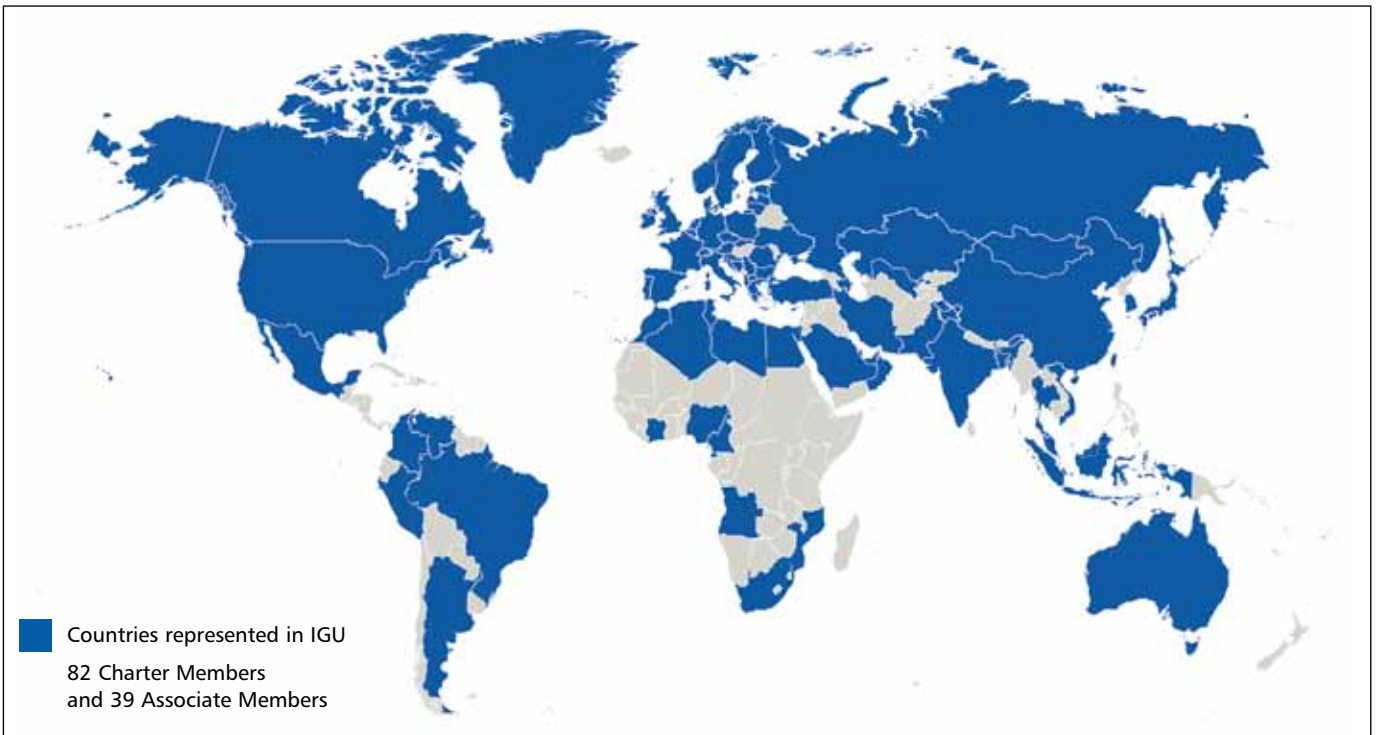
contains the largest oil accumulation ever found in Brazil: the offshore pre-salt layer. To confront this challenge, Petrobras is employing its usual strategy: research, technology, investments and safety. If the future is a challenge, Petrobras is ready for it.



CHALLENGE IS OUR ENERGY

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Albania	Czech Republic	Lithuania	Singapore
Algeria	Denmark	Macedonia	Slovak Republic
Angola	Egypt	Malaysia	Slovenia
Argentina	Equatorial Guinea	Mexico	South Africa
Australia	Estonia	Monaco	Spain
Austria	Finland	Mongolia	Sweden
Azerbaijan	France	Morocco	Switzerland
Belgium	Germany	Mozambique	Taiwan, China
Bosnia and Herzegovina	Greece	Netherlands, The	Thailand
Brazil	Hong Kong, China	Nigeria	Timor-Leste
Brunei	India	Norway	Trinidad and Tobago
Bulgaria	Indonesia	Oman, Sultanate of	Tunisia
Cameroon	Iran	Pakistan	Turkey
Canada	Ireland	Peru	Ukraine
China, People's Republic of	Israel	Poland	United Arab Emirates
Colombia	Italy	Portugal	United Kingdom
Côte d'Ivoire	Japan	Qatar	United States of America
Croatia	Kazakhstan	Romania	Uzbekistan
Cyprus	Korea, Republic of	Russian Federation	Venezuela
	Latvia	Saudi Arabia	Vietnam
	Libya	Serbia	





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Argentina

Instituto Argentino del
Petróleo y del Gas

Australia

Australian Gas Industry
Trust

Austria

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Vereinigung für das
Gas- und Wasserfach
(ÖVGW)

Azerbaijan

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the Azerbaijan Republic
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Gaziers Belges

Bosnia and Herzegovina

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Bosnia and Herzegovina

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Canalizado (ABEGAS)

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Brunei Energy
Association

Bulgaria

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Cameroon

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Canada

Canadian Gas
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Colombia

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Côte d'Ivoire

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de la Côte d'Ivoire

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Croatian Gas Association

Cyprus

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Gas G.E.

Estonia

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Association

Eurogas

Finland

Finnish Gas Association

France

Association Française
du Gaz (AFG)

Germany

Deutsche Vereinigung
des Gas- und
Wasserfaches e.V.
(DVGW)

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of Greece (DEPA) S.A.

Hong Kong, China

The Hong Kong &
China Gas Co. Ltd

India

Gas Authority of India
Ltd (GAIL)

Indonesia

Indonesian Gas
Association (IGA)

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National Iranian Gas
Company (NIGC)

Ireland

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Bord Gais Eireann

Israel

The Israeli Institute of
Energy & Environment

Italy

Comitato Italiano Gas
(CIG)

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The Japan Gas
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Kazakhstan

KazTransGas JSC

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Libya

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Lithuania

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Macedonia

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Association

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Nederland (KVGN)

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Norway

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Pakistan

Petroleum Institute of
Pakistan

Peru

Perúpetro S.A.

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Polskie Zrzeszenie
Inżynierów i Techników
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Polish Gas Association

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Associação Portuguesa
das Empresas de
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Qatar Liquefied Gas
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<i>United Kingdom</i> The Institution of Gas Engineers and Managers	<i>Uzbekistan</i> Uzbekneftegaz (UNG)	<i>Vietnam</i> Vietnam Oil and Gas Group (PetroVietnam)

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E.ON Ruhrgas AG (Germany)	Spetsneftegaz NPO JSC (Russia)
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GAZBIR – Association of Natural Gas Distributors of Turkey	Vopak LNG Holding B.V. (The Netherlands)
GDF SUEZ (France)	Wintershall (Germany)
IGDAŞ – Istanbul Gas Distribution Co. (Turkey)	Woodside (Australia)
Indian Oil Corporation Ltd (India)	

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Energy Delta Institute (EDI)	NGV Global
Gas Infrastructure Europe (GIE)	International Pipe Line & Offshore Contractors Association (IPLOCA)
Gas Technology Institute (GTI)	MARCOGAZ – Technical Association of the European Natural Gas Industry
GERG – Groupe Européen de Recherches Gazières/European Gas Research Group	Pipeline Research Council International, Inc. (PRCI)
GIIGNL – Groupe International des Importateurs de Gaz Naturel Liquéfié/International Group of LNG Importers	Russian National Gas Vehicle Association (NGVRUS)

I AM PART OF THE SOLUTION



Gerbrand Bruin & Max

Beachcombers and supporters of the Sustainable Ameland Open Lab

My adventures at sea have taken me to all four corners of the globe. I have seen the world, but Ameland is the only place I could ever call home. Here, we are aware of how vulnerable nature is. This is why we are always looking for ways to keep the island clean. This means using less energy and generating energy in a smarter way. As a beachcomber, I am doing my bit to keep the island clean.

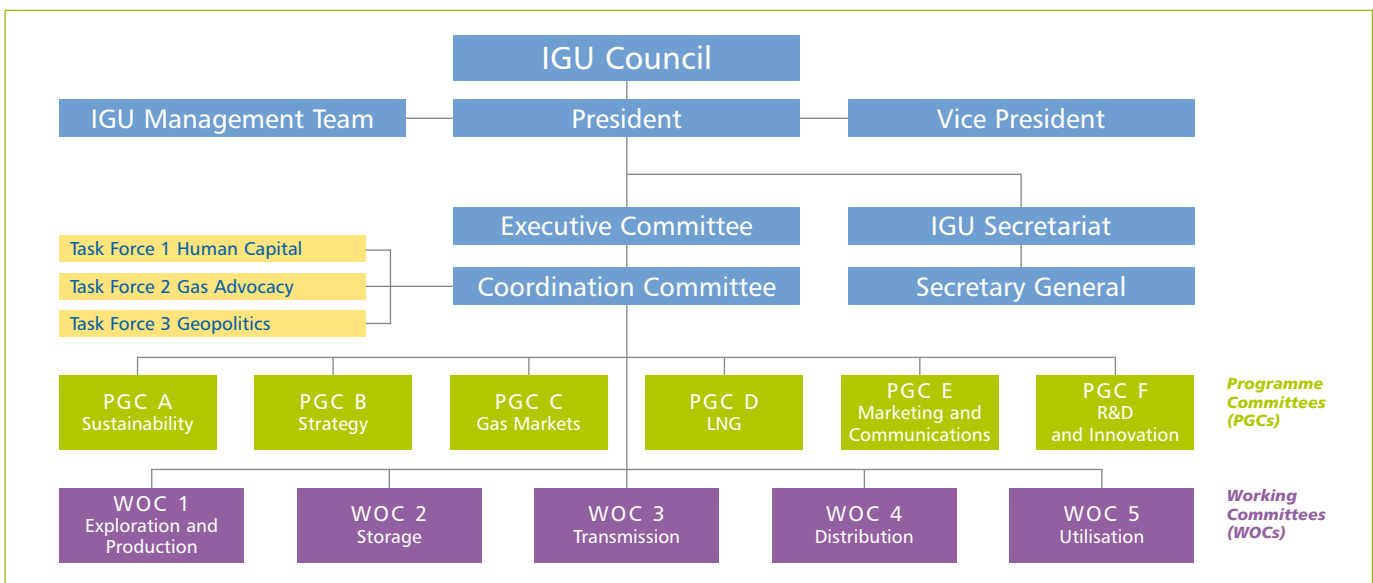
GasTerra is also doing its bit. As the instigators of the "Sustainable Ameland" project, we show how alternative energy sources can be practically applied in order to speed up the transition to a sustainable society. And time and time again, natural gas has played a key role in this transition. We are therefore part of the solution.

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See my
story!



IGU Organisation 2012–2015



This photograph was taken at the Executive Committee (EXC) meeting which was held in Ottawa, Canada, in October 2012.

From left to right in the very front are: David Byers (who was substituting for Cheryl Cartwright), Kalad Badji, (who was substituting for Abdelhamid Zerguine), Marcel Kramer and Cynthia Silveira.

From left to right in the main front row are: Jean Schweitzer, Mel Ydreos, Chris Gunner, Datuk (Dr) Abdul Rahim Hj Hashim, Jérôme Ferrier, David Carroll, Torstein Indrebø (IGU Secretary General, not a member of the EXC), Georges Liens, Qing Wang (who was substituting for Xia Yongjiang) and Lix-in Che. *From left to right in the middle row are:* Walter Thielen, Kang Soo Choo, David McCurdy,

Luis Domenech, Evgueni Riazantsev, Runar Tjersland and Carlos Seijo.

From left to right in the back row are: Gertjan Lankhorst, Pavol Janočko, Kap-Young Ryu, Marta Margarit (who was substituting for Antoni Peris Mingot), Jupiter Ramirez, Philippe Miquel, Timothy M. Egan and Hiroyuki Wada. Khaled Abubakr could neither attend nor send a substitute.

IGU Management Team



Mr Jérôme Ferrier, President
(France)



Mr David Carroll, Vice President
(USA)



Datuk (Dr) Abdul Rahim Hj Hashim,
Immediate Past President
(Malaysia)



Mr Georges Liens, Chair of the
Coordination Committee (France)



Mr Mel Ydreos, Vice Chair
of the Coordination Committee
(Canada)



Mr Torstein Indrebø, Secretary
General

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Mr Jorge Javier Gremes
Cordero, Argentina

Ms Cheryl Cartwright,
Australia

Mr Luis Domenech,
Brazil

Ms Li-xin Che, China

Mr Timothy M. Egan,
Canada

Mr Mel Ydreos, Canada

Mr Jean Schweitzer,
Denmark

Mr Jérôme Ferrier,
France

Mr Georges Liens,
France

Mr Walter Thielen,
Germany

Mr Hiroyuki Wada,
Japan

Mr Kap-Young Ryu,
Republic of Korea

Datuk (Dr) Abdul Rahim
Hj Hashim, Malaysia

Mr Gertjan Lankhorst,
The Netherlands

Mr Runar Tjersland,
Norway

Mr Jupiter Ramirez,
Qatar

Mr Evgueni Riazantsev,
Russia

Mr Pavol Janočko,
Slovak Republic

Mr Antoni Peris Mingot,
Spain

Mr David Carroll, United
States of America

Hon. David McCurdy,
United States of America

Mr Xia Yongjiang, China
National Petroleum
Corporation, Associate
Member

Mr Philippe Miquel, GDF
SUEZ, Associate Member

Mr Chris Gunner, Shell,
Associate Member

Mr Khaled Abu Bakr,
TAQA Arabia, Associate
Member

Ms Cynthia Silveira,
Total, Associate Member

Kang Soo Choo
IGU Regional
Coordinator for Asia and
Asia-Pacific

Marcel Kramer

IGU Regional
Coordinator for the
Russia-Black Sea-Caspian
area

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Yemen LNG Company



News from the Secretariat

The IGU Secretariat's main activities since the last edition of the IGU Magazine (October 2012-March 2013) are detailed below in news items and general information.

▼ The staff of the IGU Secretariat: (from left to right in the front row) Hans Riddervold, Special Projects; Torstein Indrebø, Secretary General; Sjur Bøyum, Communication Manager & Webmaster; (from left to right in the back row) Ksenia Gladkova, Senior Advisor to the Secretary General; Carolin Oebel, Director; Silje Storsul, Administration Consultant; Mats Fredriksson, Senior Advisor to the Secretary General.

Secretariat staff changes and new office New secondee from Oman

Oman LNG has seconded Ms Khadija Omar Al-Siyabi to work in the Secretariat. Khadija holds a Bachelor of Science and a Masters in Business Administration (MBA) from Sultan Qaboos University, Oman. She has former working experience with Shell Oman Marketing, and from late 2007 worked for Oman LNG as Marketing Support Administrator covering LNG sales and purchase agreements. She was due to start work in the Secretariat as we went to press.

Change of Director

Hans Riddervold retired from his full-time position as Director in the Secretariat at the end of 2012. He was instrumental in ensuring a successful transfer of the Secretariat to Oslo in November 2007, and managed many of the key initiatives and projects of IGU in the subsequent five years. Hans will continue to work part-time on special projects so we can continue to benefit from his vast experience in IGU affairs and energy issues.

IGU has agreed with E.ON Ruhrgas to extend the secondment period of Carolin Oebel until October 2014. She was appointed Director with effect from January 2013 and has assumed the main responsibilities of Hans. The extension will ensure continuation of the Secretariat's administrative and managerial capacity.

IGU has moved to new offices

On November 19, 2012, IGU left the offices in Kjørboveien, which it had occupied since 2007, and has moved closer to the railway station in Sandvika. The new visiting address for the IGU Secretariat is Malmskriverveien 35, 1337 Sandvika. The postal address is: IGU c/o Statoil ASA, PO Box 3, 1330 Fornebu, Norway.

IGU at COP 18

Following the successful activities on the sidelines of previous UN Climate Change Conferences, IGU was also present at COP 18 in Doha, Qatar, November 26-December 7, 2012.

IGU had an exhibition stand and a side event with the theme "Natural Gas for a Global Sustainable Energy Future" in the conference venue. The presentations held at the side event





◀ Carolin Oebel and Mats Fredriksson at IGU's COP 18 stand.

Proceedings from WGC 2012

The proceedings of the 25th World Gas Conference are now available at www.WGC2012.com or via the IGU website www.igu.org/wgc-2012. The proceedings can be accessed without a password and are open to everyone.

IIASA meeting

The Secretary General and Carolin Oebel visited the Vienna-based International Institute for Applied Systems Analysis (IIASA) late last summer to learn about the IIASA Energy Programme and to brief IIASA on IGU activities. Both organisations see opportunities for further cooperation on energy-related topics.

IGU elections of hosts

The processes of electing new hosts for IGRC 2017 and WGC 2021 have started. The invita-

can be downloaded from the website, and there is a report on pages 168-174 of this issue of the magazine.

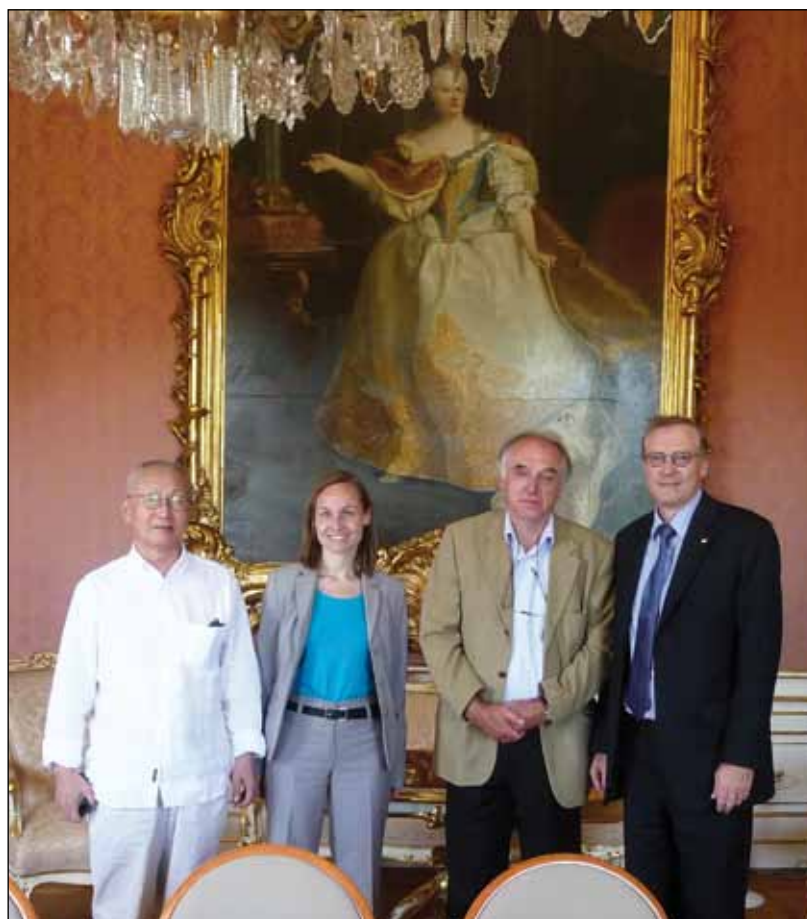
This year's UN Climate Change Conference, COP 19 is scheduled to be held in Warsaw, Poland, November 11-22.

UN initiative "Sustainable Energy for All"

Following previous meetings with UNIDO, IGU and UNIDO together with World Bank representatives have intensified their discussions on "Sustainable Energy for All" and how IGU can contribute. In this context, IGU was invited to speak at a World Bank conference marking the 10th anniversary of the launch of the Global Gas Flaring Reduction (GGFR) public-private partnership as well as at a high-level energy forum on sustainable energy for the Economic Community of West African States (ECOWAS). Both conferences took place in October 2012 and are covered in more detail below (see IGU at international events).

Discussions continue regarding a training programme for the sub-Saharan Africa region.

▼ Torstein Indrebø and Carolin Oebel with Professor Dr Pavel Kabat, IIASA Director/CEO (third from left) and his Special Advisor Chin-Min Lee (left). The portrait behind them is of Empress Maria Theresa (1717-1780).





▲ From left to right at Holdigaz are Sjur Bøyum, Torstein Indrebø, Philippe Petitpierre, Antoine de Lattre and Bernard Gardiol.

tions to apply for the hosting of IGRC 2017 were sent out in February with the application deadline set for June 15. The invitation letters for the IGU Presidency 2018-2021 and the hosting of the 28th WGC in 2021 will be sent out early this summer. We look forward to receiving applications from interested parties.

Gas Naturally cooperation continues

The seven gas associations working together under the Gas Naturally umbrella (www.gasnaturally.eu) are continuing their cooperation. The organisations are IGU, Eurogas, GERG, GIE, GIIGNL, the International Association of Oil and Gas Producers (OGP) and Marcogaz. The programme for 2013 consists of a gas

► From left to right at the European Commission are Brendan Devlin, Michel Romieu, Jérôme Ferrier, Philip Lowe and Torstein Indrebø.



week in Brussels (April 23-25), a Member States Forum on November 13 and several roundtable conferences. The work will mainly target the EU Parliament and Commission to advocate for gas.

Visit to Vevey, where IGU is registered

As stated in the IGU Articles of Association, IGU is registered in Vevey in the Canton of Vaud, Switzerland. In November 2012, the Secretary General and Sjur Bøyum, Communication Manager visited Vevey and Holdigaz, which owns the local gas distribution company. Philippe Petitpierre, Chairman of Holdigaz, has helped IGU liaise with the registrar over many years.

The IGU delegation met Philippe Petitpierre, Antoine de Lattre and Bernard Gardiol of Holdigaz to discuss IGU activities and gas marketing challenges. The IGU delegation also visited the registrar's office in Moudon, a 40-minute drive from Vevey. Originally there was a local registry office in Vevey but there is now one office in Moudon covering all of Vaud. Here the records of IGU were inspected and photos taken.

Visit to the European Commission

The IGU President, Jérôme Ferrier, his special advisor, Michel Romieu, and the Secretary General met the European Commission's Director General for Energy, Philip Lowe and



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► Torstein Indrebø presents the IGU Diploma to James Kwan in recognition of his services as Regional Coordinator for Asia-Pacific.



staff members Brendan Devlin and Laurent Tourbach in Brussels in January.

The purpose of the visit to the EC was to brief Mr Lowe and his colleagues on the changeover of the IGU Presidency and IGU activities, and more specifically on the role gas can play in the future EU energy portfolio. Jérôme Ferrier said that the IGU community would benefit from insight into EU energy policy and from sharing the EU experience in the field of energy policy implementation.

In return, Mr Lowe briefed IGU on the main content of the EU Roadmap 2050 and the debate taking place among the 27 EU nations. He underlined the importance of gas in the long term, and acknowledged IGU's work on

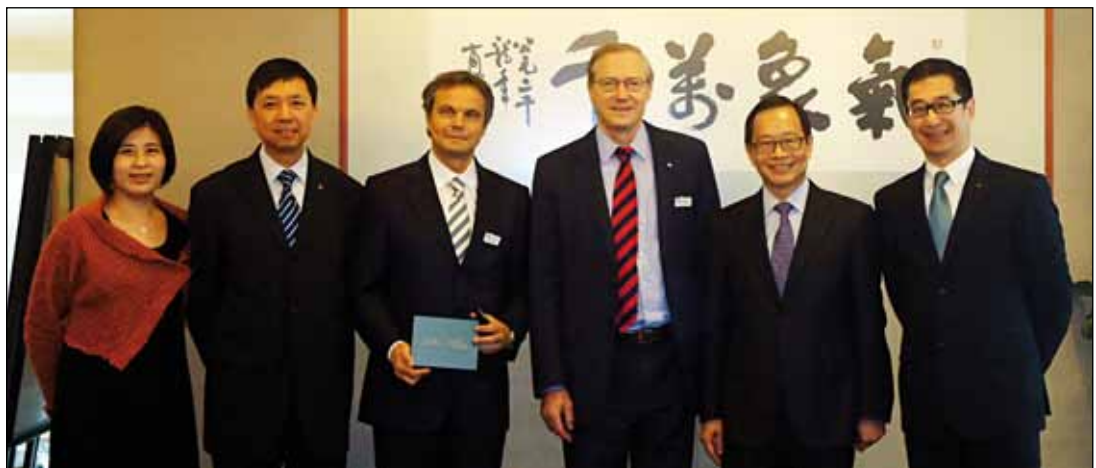
the drivers impacting energy markets. Given IGU's global membership and closeness to events, he said he would be pleased to see such analysis of other regions of the world.

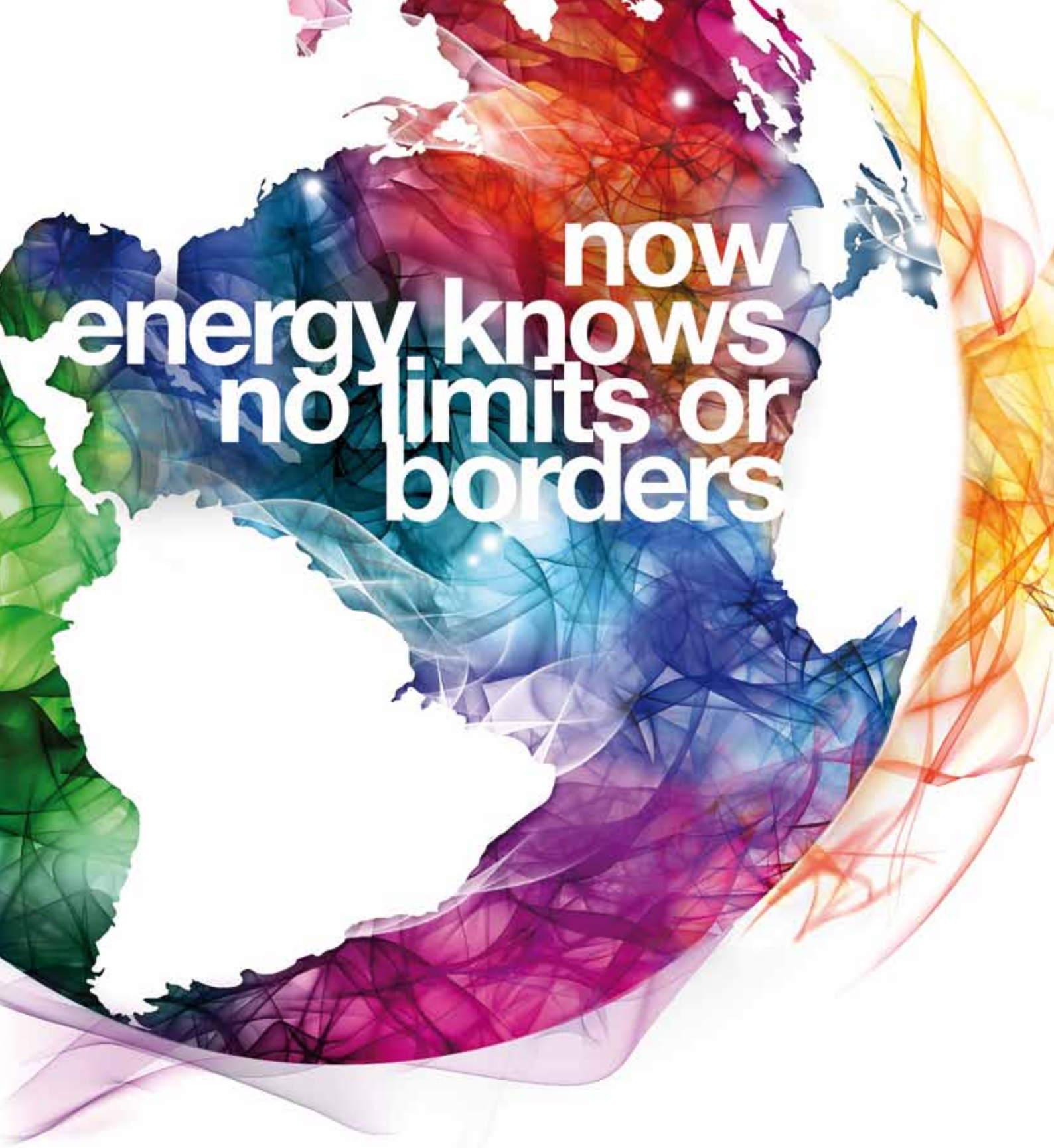
Visit to IGU member in Hong Kong

On their way to Beijing in January to discuss preparations for the forthcoming IGU meetings, the Secretary General and Mats Fredriksson, Senior Advisor, visited Towngas, the Hong Kong and China Gas Company Ltd. They presented the IGU Diploma that was awarded by the Council to James Kwan, Executive Director & Chief Operating Officer of Towngas in recognition of his services as the Regional Coordinator for Asia-Pacific in the 2009-2012 Triennium, and also discussed future focus areas of IGU.

Mr Kwan and his colleagues, Sham Man Fai, General Manager – Production & Technology, Duncan W. O. Wong, General Manager – Marketing, and Melody F. W. Yeung, Professional Qualification Development Officer briefed IGU on the business achievements of Towngas, which celebrated its 150th anniversary in 2012, and the prospects for gas in Hong Kong and mainland China. Natural gas has a strong position in Hong Kong in the residential, commercial and industrial sectors. Towngas has more than 15 million customers and business is growing. Gas is also gaining market share in the transportation sector where it reduces the

► From left to right at Towngas are Melody Yeung, Sham Man Fai, Mats Fredriksson, Torstein Indrebø, James Kwan and Duncan Wong.





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carbon footprint and improves air quality, which is important in the large urban areas in China.

Preparing for the IGU meetings in China

The Secretary General and Mats Fredriksson visited China Gas Society (CGS) in January to discuss the preparations and detailed programme for the meetings of the Coordination Committee, Executive Committee and Council. These will be held in Beijing, October 22-25. As CGS is based in Tianjin, where IGU held its meetings in 2005, a team from the Beijing Gas Group is supporting CGS in the planning and implementation of these important meetings. As usual, IGU will organise a workshop with international speakers for all the delegates on October 24, the day before the Council meeting.

IGU meeting with China National Petroleum Corporation

During their visit to China in January, the Secretary General and Mats Fredriksson also met Zhang Xin, Director General of CNPC's International Department, Wang Guangjun, Vice President of the Research Institute of Petroleum Exploration & Development (RIPED) in Lafang and Xia Yongjiang, Director, RIPED-Lafang and a member of the IGU Executive Committee, plus CNPC gas experts to discuss areas of common interest.

CNPC experts presented an overview of gas market developments in China where annual consumption has reached more than 100 bcm and continues to grow. In addition to domestic production, China imports gas via pipelines from Turkmenistan, Kazakhstan and in the

► Torstein Indrebø and Mats Fredriksson with Da Xu, Vice General Manager, Beijing Gas Group (second left) and Li Jian Xun, Vice President & General Secretary, China Gas Society (right).



form of LNG via several receiving terminals. A new pipeline from Myanmar to China is due to open in May and will further contribute to supply security and diversification. CNPC operates a network of about 36,000km of gas pipelines.

China is likely to become one of the largest gas markets in the world in a few years and can offer a robust and long-term demand potential for new volumes. IGU updated the CNPC delegation on recent activities and future plans, and shared information on forthcoming events.

IGU at international events

5th Central European Gas Congress

The 5th Central European Gas Congress took place September 11-12, 2012 in Prague, Czech Republic. It was attended by some 110 dele-

gates and speakers, and Hans Riddervold gave a speech on IGU's *Global Vision for Gas* report.

Slovak Gas and Oil Association

IGU was represented by the Secretary General at a ceremonial conference "Central European Gas-Oil Transmission Corridor" to mark the anniversaries of the Friendship oil pipeline and the Brotherhood and Eustream gas pipelines. Friendship was celebrating 50 years of operation, Brotherhood 45 and Eustream 40. The conference took place in Bratislava, Slovak Republic on September 18, 2012.

The Secretary General gave a keynote address and congratulated the Slovak government and its oil and gas industry for the important contribution to securing safe transit of oil and gas to millions of customers in



◀ Torstein Indrebø and Mats Fredriksson in Beijing with Zhang Xin, Director General of CNPC's International Department (centre) and CNPC staff. Behind the group is a statue of "Iron Man" Wang Jinxi (1923-1970), whose drilling team played an important role in the development of China's petroleum industry.

Europe. The event was attended by high-level guests from European institutions, governments and industry. Ján Klepáč, Executive Director of the Slovak Gas and Oil Association has contributed a separate article on the history of the pipelines on pages 186-187.

IGU President gives presentations

Jérôme Ferrier gave presentations at Rio Oil & Gas on September 19, 2012 and GASEX on October 9, 2012, which are covered in detail in the article on pages 44-48.

World Shale Conference

David Carroll, IGU Vice President and President & CEO of GTI gave the welcome speech at the 4th World Shale Oil & Gas Conference & Exhibition in Houston, USA, September 18-21. As the world deals with numerous challenges related to sluggish economies, climate change concerns, natural disasters and more, he said, natural gas stands out as a bright light of growth and opportunity for many nations.

Declaring the conference to be important and timely, he pointed out that the shale gas revolution has had a profound impact on North America's energy balance and has the potential to influence the global industry for decades to come.

Perspectives on the shale gas/oil industry

Mel Ydreos, Vice Chair of the Coordination Committee and Vice President of Spectra Energy, gave a speech entitled "Opportunities, Challenges and Perspectives for Shale Gas/Oil Development" on October 1, 2012 in Mexico City. He talked about the economics of shale gas/oil production and what regulatory and operational conditions are needed in countries outside of the US and Canada to achieve commercial production of these resources.

Gas and Coal Market Outlook Symposium

The symposium was organised by IEA, IEF and OPEC in Paris on October 4, 2012 and gathered representatives from academia, international

► David Carroll addresses World Shale in Houston.



organisations, regulators, governments, industry and the finance community. IGU was represented by the Secretary General. The event provided a good opportunity to discuss areas of common interest and to interact with energy experts from many sectors.

Atlantic Council/REKK conference

Carolyn Oebel gave a speech entitled "Global Vision for Gas – the Pathway to a Sustainable Energy Future" at a special conference jointly organised by the Atlantic Council and Budapest-based Regional Centre for Energy Policy Research (REKK). The conference was held in Budapest, Hungary, October 4-5, 2012, under the theme "The Next 40 Years: Advancing EU Energy Objectives in East Central Europe".

Oil & Gas International Conference, Kiev

The 2012 edition of this conference looked at the reform, modernisation and development of the oil and gas industry in Ukraine. Participants and the majority of the speakers were from companies active in the Ukrainian energy market. IGU, which was invited for the fourth year, had the first speaker slot after the Deputy Chairman of the Board of Naftogaz, Vadym Chaprun, who opened the conference. Mats Fredriksson gave a presentation focusing on two subjects, the IGU report on a global vision for gas and shale gas opportunities in Ukraine.

Kazenergy, Astana

The Secretary General attended the Kazenergy Eurasian Forum on October 3, 2012 as a panellist in a lunch conference organised by the International Herald Tribune (IHT) under the theme "Gas Industry Development in Eurasia". The Executive Editor of IHT led the event which discussed formation of a global gas market model: structure, features and trends. Among the panellists were the Chairman of China Industrial Overseas Development and the Senior Analyst of the consulting company Argus.



◀ Jonathan Stern of the Oxford Institute (left) talks to Torstein Indrebø during a break in the IEA/IEF/OPEC symposium in Paris.

GGFR 10th anniversary, London

The World Bank held a conference in London, October 24-25, 2012, to celebrate the 10th anniversary of the Global Gas Flaring Reduction partnership. The IGU Magazine has published several articles on this important partnership, most recently in the April-September 2012 issue.

The Secretary General addressed participants in the session "The Way Forward" on the various options for utilisation of natural gas. Carolyn Oebel also attended the anniversary conference.



◀ Torstein Indrebø addresses the GGFR 10th anniversary conference in London.



▲ Jérôme Ferrier, Beate Raabe, Secretary General of Eurogas and Klaus Schäfer, CEO of E.ON Ruhrgas at the Gas of Russia 2012 Forum.

UN: Sustainable Energy for All

UNIDO and the government of Ghana jointly organised a high-level energy forum with the theme “Paving the Way for Sustainable Energy for All in West Africa through Renewable Energy and Energy Efficiency” from October 29-31, 2012, in Accra, Ghana.

UNIDO invited IGU to give a presentation on the role of natural gas in developing countries and how gas can contribute to the “Sustainable Energy for All” initiative launched by the UN Secretary General, Ban Ki-moon. The IGU delegation consisted of the Secretary General, who also participated in a panel discussion, Hans Riddervold and Carolin Oebel. On the sidelines of the conference, IGU met UN representatives and governmental delegates.

IGU also visited the Ministry of Energy to brief Ghanaian representatives on IGU activities

▼ Torstein Indrebø on the panel at the sustainable energy forum in Accra.

and discuss membership. Ghana has significant gas reserves and has established a gas master plan which includes gas-based power generation and industrial development.

2012 Autumn Gas Conference

Jérôme Ferrier attended the 2012 Autumn Gas Conference of the Czech Gas Association in Prague on November 6, and gave a presentation on “Security of Supply and Liberalisation: The Role of Infrastructures”. He reviewed the impact on security of supply of the reorganisation of the EU gas market over the last 15 years, and the role of infrastructure in mitigating risks in the new liberalised market paradigm.

10th International Forum “Gas of Russia 2012”

Jérôme Ferrier gave a speech entitled “Natural Gas – Providing Solutions to the Global Energy Challenges” in Moscow, Russia on November 20, 2012. He was invited to this event by Valery Yazev, President of the Russian Gas Society.

Energy Charter Conference

The Polish government and Energy Charter hosted a conference on Global Energy Governance in Warsaw on November 27, 2012. The Secretary General was invited to speak about “Governance: from Politics to Projects” and presented the many ways gas can meet the world’s energy challenges.





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▲ Sjur Bøyum at the UNECE Committee on Sustainable Energy.

Energy Charter is a global governmental membership organisation. Most of its members attended the event together with representatives of the European Commission and other international organisations. IGU used the opportunity to distribute publications and meet with country delegations on the sidelines of the event.

World Shale series: Latin America

Jérôme Ferrier gave the welcoming keynote speech at the World Shale Oil & Gas Latin America Summit, which was held in Buenos Aires, Argentina, November 28-30, 2012. He quoted IEA estimates which put the technically

recoverable shale gas reserves of countries in South and Central America at some 53 tcm – nearly 29% of the global total – with Argentina having the largest share. He also pointed out the potential their development could have for the economic development in the region.

UNECE Committee on Sustainable Energy

The Secretary General and Sjur Bøyum attended the 21st session of the the UN Economic Commission for Europe’s Committee on Sustainable Energy in Geneva, Switzerland on November 28, 2012.

IGU presented highlights from the “Global Vision for Gas” report. The committee discussion focused on “Managing Change: Enabling the Shift to Sustainable Energy”. In line with the objectives of the UN Secretary General’s initiative on “Sustainable Energy for All”, the discussion considered the situation in the UNECE region in relation to access to energy for all. Delegates looked at doubling the rate of energy efficiency and increasing the share of renewables in the energy mix.

Great Rift Valley Energy Summit

The Secretary General represented IGU at the Great Rift Valley Energy Summit, which was held in Nairobi, Kenya, December 2-4, 2012. The summit focused on the energy challenges

▶ Torstein Indrebø meeting the Tanzanian delegation during the Great Rift Valley Energy Summit.



in East Africa which is rich in energy resources. Recent oil and gas discoveries both on and offshore have further increased the potential for domestic production and exports. In spite of a vast reserve base, energy access in general is low compared to other regions of the world. Governments and industry were represented at high levels together with delegates from international banks, the UN, the World Bank and service companies.

The debate covered a wide range of energy sources including oil, gas, coal, nuclear and renewables. The Secretary General spoke about how gas could contribute to sustainable social and economic development, and was interviewed by the national TV station. Several government representatives expressed interest in IGU membership.

2013 – Year of Ecology

To mark the launch of its Year of Ecology initiative, Gazprom organised a conference looking at the prospects for further development of low-carbon and renewable energy sources in Moscow, December 11-12, 2012.

Ksenia Gladkova, Senior Advisor represented IGU with the presentation “Natural Gas and Renewables: A Perfect Combination to Achieve the Sustainable Energy Future”. Gazprom representatives participated with a number of presentations which highlighted the importance of natural gas in the Russian fuel mix as the cleanest and most efficient fossil fuel. The conference made an important contribution to the promotion of natural gas.

UNECE Working Party on Gas

Carolin Oebel gave a presentation on “Gas – Part of a Sustainable Energy Future” at the roundtable entitled “Natural Gas Markets in the UNECE Region: Key Issues and Trends”, which was held during the UNECE Working Party on Gas meeting in Geneva, Switzerland on January 22.

Partners for the Future of Natural Gas

Natural gas holds great promise for the global energy future, and AGA is pleased to be working with the IGU French Presidency in advocating for natural gas as an integral part of a sustainable global energy system.

Cameroon LNG: Converting stranded gas into valuable resources, and unlocking the gas exploration potential

After having long been an oil producer, Cameroon is now looking at LNG to further develop its hydrocarbon potential.

Estimated discovered gas resources amount to approximately 4 tcf and are split between several independent upstream operators. The exploration potential is 5 times higher, but until today there has not been any commercial gas production. Consequently, no gas-focussed exploration campaign has ever been launched.

To monetise its gas reserves, the State of Cameroon outlined in 2008 its political vision in a Gas Master Plan, allocating significant volumes of gas to a single LNG export project, Cameroon LNG, and selected GDF SUEZ as strategic partner to work jointly with its national oil company, Société Nationale des Hydrocarbures (SNH) in that regard.

The project includes a liquefaction plant of up to 3.5 mtpa that will be located on a 470 hectare site granted to the project by the State in 2010. Technical feasibility of the project has been confirmed during the pre-FEED performed by Foster Wheeler and completed in May 2011, based on standard and proven technology. The sponsors intend to launch the FEED study in 2014.

A 270 km shallow-water offshore gas gathering pipeline along the Cameroon coast will connect gas fields to the LNG plant located in Kribi, in the south of the country.



The *Provalys*, one of the 17 vessels in the GDF SUEZ LNG carrier fleet. The Group manages an LNG portfolio of 16 million tons per year, the third largest in the world.

Preliminary commercial agreements have already been signed with all producers having access to significant gas resources in the country, for a combined volume of 3.1 tcf. LNG off-take revenues will be underpinned by long-term purchase contracts with GDF SUEZ. Société Générale, acting as financial advisor for the project, has confirmed its bankability.

A Framework Agreement was signed in late 2010 by the State of Cameroon and GDF SUEZ to confirm the essential fiscal, financial and commercial principles of the project. An amendment to the Gas Code law was approved by the Parliament and enacted by HE President Biya last May, enabling the State to enter into a Convention for the Cameroon LNG project. In addition, the State of Cameroon is implementing gas PSC terms

providing clear incentives for gas production and exploration tied to the project.

The project is paying great attention to the benefits for Cameroon. Among others, it is expected to provide stable long-term revenues for the State, produce significant volumes of LPG which is much needed for the local market, foster the development of the local gas industry and employment, and create incentives for gas exploration.

SNH and GDF SUEZ are confident that, thanks to its unique strengths, such as strong State support, tax incentives, low project development costs and complementarity between project participants, Cameroon LNG will soon be a success, fostering further gas exploration and developments in Cameroon.



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First Assignments for IGU's New President

By Jérôme Ferrier

The Rio Oil & Gas Conference in Brazil was the scene for Jérôme Ferrier's first address to a non-IGU audience as President. On September 19, 2012, he took part in a plenary session looking at energy supply challenges in the 21st century. This was the 30th anniversary of the biennial event which is organised by IGU Associate Member IBP, the Brazilian Institute of Petroleum, Gas and Biofuels.

The following month, on October 9, he gave a keynote speech on the global economy and cooperation through gas trading at GASEX 2012, which was held in Bali, Indonesia.

GASEX, the Gas Information Exchange in the Western Pacific Area was launched in 1990 and is held biennially. Here we present edited versions of the two addresses.

RIO OIL & GAS CONFERENCE – energy supply challenges in the 21st century

Although proven reserves in some of the principal gas producers in the Southern Cone and neighbouring countries have declined over

the last decade, there is enormous potential for growth. There are promising conventional prospects, particularly in the Brazilian pre-salt and Bolivia's Incahuasi fields, while Argentina and Brazil have significant shale gas potential.

In this new context of abundance of resources, most of them available at an affordable price, and taking into account increasing gas demand for electricity generation in environmentally acceptable conditions, there is no doubt in my mind that the Southern Cone will benefit, as an active player, from the Golden Age of Gas anticipated by IEA.

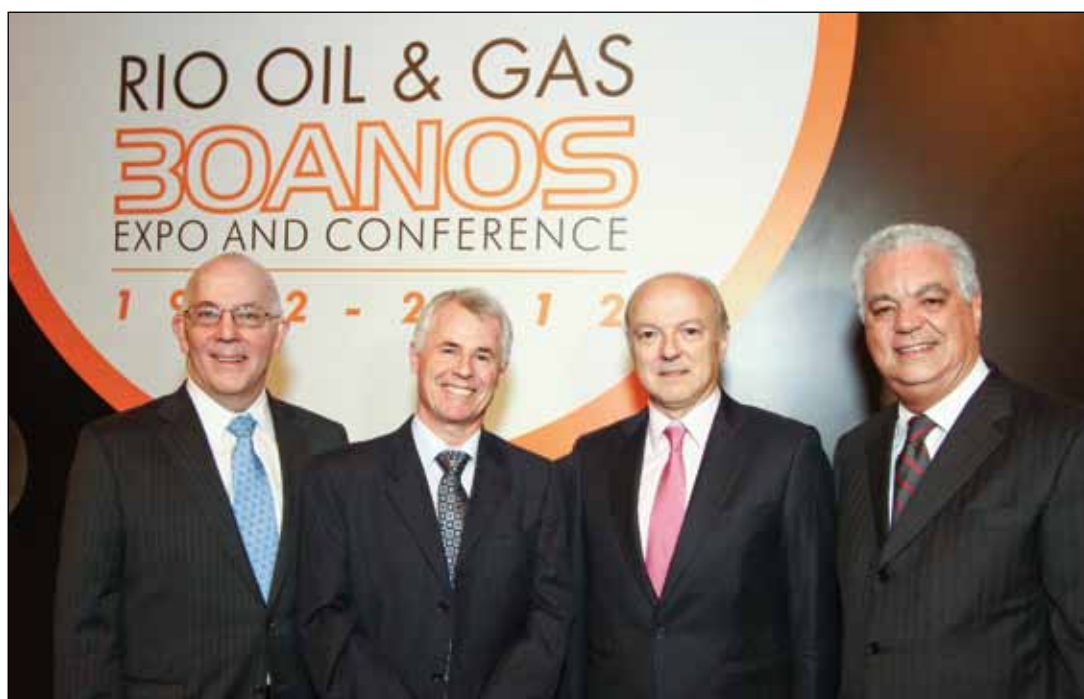
In concrete terms, this means that cross-border gas trade involving the Southern Cone and neighbouring countries is set to expand and additional pipeline infrastructure needs to be developed. The structure of gas consumption will also change, with power generation accounting for a greater share in all countries.

This new situation offers opportunities to the countries of South America, but also implies institutional challenges; and IGU is committed to playing an active role in the regional process, through a series of actions:

- ◆ Supporting the voice of its members in favour of a long-term gas strategy, in the regional and international institutions and towards policymakers and opinion leaders;
- ◆ Demonstrating, through the experience of its members in other parts of the world, how much natural gas can contribute to sustainable economic development while allowing access for the largest number of people to an affordable source of energy and power;
- ◆ Advocating the implementation of favourable geopolitical conditions for the develop-

► Jérôme Ferrier addressing Rio Oil & Gas (BELOW). The plenary session he took part in was chaired by IBP President, João Carlos de Luca (OPPOSITE, far right in picture) and also addressed by Adam Sieminski, Administrator of the US Energy Information Administration (left) and Renato Bertani, President of the World Petroleum Council (second left).





ment of further cross-border exchanges leading to the long-awaited effective integration of the energy sector in the Southern Cone and neighbouring countries.

To this end, IGU will help organise a Regional Gas Forum in 2013, in conjunction with IBP, the Argentine Institute of Petroleum and Gas (IAPG) and the Regional Association of Oil, Gas and Biofuels Sector Companies in Latin America and the Caribbean (ARPEL), which will gather policymakers of the South American countries together with private investors and industry stakeholders. The aim is to discuss the main issues involved and the most effective ways of creating a large integrated energy market in the Southern Cone.

IGU also wishes to enlarge its membership by persuading other South American countries to join the Union, in particular, Bolivia, Chile and Uruguay; Colombia having recently decided to join us. The support of our existing members in the region will be of great help here.

Finally, I thought that it would be of interest to present, in light of the ongoing implementation of the large single gas market in the

European Union, what I consider as the key challenges for an effective regulatory integration. In Europe, it has taken more than 10 years to create the conditions allowing a liquid and transparent regional gas market to form and, although much remains to achieve, it is possible to identify the best regulatory options and the pitfalls.

Indeed, I have identified four key challenges:

Foster infrastructure integration by ensuring the bankability of new transcontinental gas pipelines and cross-border interconnections

The first challenge relates to the incentives needed to sustain investment in new infrastructure.

Experience has proved it necessary to implement the following measures: granting third-party access (TPA) exemption for large infrastructure projects, so as to give a clear priority of use by their sponsors; protecting the investors against currency risks; and allowing enhanced regulated rates of returns for projects of common interest that would not be bankable at the normal rate applicable to the already partially depreciated asset base of transporters.

► Jérôme Ferrier addressing GASEX 2012 (RIGHT) and touring the exhibition (BELOW) with Indonesia's Minister of Energy and Mineral Resources, Jero Wacik (right in the picture with glasses).



Ensure compatibility of tariff systems between national and transit flows

The second challenge concerns the compatibility of tariff systems between countries having cross-border exchanges and between regular and transit flows in a national grid.

It is obvious that a harmonisation of the tariff structures in the region is necessary, that shippers within a country should not bear the cost of transit flows in their own country and that the "entry-exit" tariff system within

balancing zones is a key factor of development of a trade market.

Simplify access to pipelines for cross-border shippers

The third challenge is to simplify access to pipelines for cross-border exchanges.

Introducing convergence of access rules for pipelines is essential for a friendly use of transmission systems: the main deliverable should be a common framework for a Network Code addressing such issues as capacity allocations and secondary markets, congestion management, information systems for nominations and, more generally, a standardisation of technical specifications and procedures.

Develop a regional level of integration, initiative and progress for the gas industry

The fourth challenge is the issue of a single regional level of integration of regulatory policies.

A regional regulatory agency is a valid option. It should not supersede the national regulatory institutions. However, it should have a capacity of initiative, which is quite valuable at the regional level: the implementation of "open seasons" for long- and medium-term pre-booking of capacities in new infrastructure; and fostering the development of hubs and market places and of "hub-to-hub" exchanges.

In conclusion, it seems to me that of the three pillars sustaining a successful regional integration – infrastructure, commercial relations and the regulatory framework– the last one, although invisible and soft by essence, is absolutely vital.

GASEX 2012– the global economy and cooperation through gas trading

Asia-Pacific's economic miracle has historically been fuelled by coal and petroleum. The regional energy balance remains dominated by coal, with natural gas accounting for just 11% of the primary energy mix, compared to a global average of 24%. However, mainly for



environmental reasons, the share of natural gas has grown steadily over the past two decades and Asia-Pacific is a leading force in the global LNG market.

In explaining why gas has been underutilised in the region relative to its tremendous potential, it is useful to divide the Asia-Pacific gas market into three categories of countries:

- ◆ Gas exporters, which include Australia, Brunei, Indonesia, Malaysia and Myanmar. In these countries, the share of natural gas in the primary energy mix varies from 13% (Myanmar) to 79% (Brunei), with a weighted average figure of 30%;
- ◆ Gas importers, which include China, India, Japan, Singapore, South Korea, Taiwan and Thailand. In these countries, the share of gas varies from 4% (China) to 17% (Japan), with an average figure of just 8%;
- ◆ Self-sufficient countries, which include Bangladesh, New Zealand, Pakistan, the Philippines and Vietnam. In these countries, the share of gas varies from 10% (Philippines) to 76% (Bangladesh), with an average figure of 38%.

The relatively low penetration of natural gas in the energy mix of the importing group of countries highlights the exceptional potential for further development of gas production and trade in the Asia-Pacific area. If the share of gas in the primary energy balance of importing countries were to reach the average global figure of 24%, these countries' gas consumption (416 bcm in 2011) would triple.

Such market growth is quite sustainable given the abundant gas resources. Proven reserves of conventional natural gas in Asia-Pacific have grown from 9.3 tcm in 1991 to 16.8 tcm in 2011, in spite of a near tripling in annual production to 479 bcm. Australia in particular has resources far in excess of its own needs and is likely to overtake Qatar as the world's top LNG exporter by the end of the decade.

Countries outside the region constitute another large potential source of natural gas, which can be imported via pipelines or as LNG.

In 2011, the international gas trade involving Asia-Pacific countries amounted to 250 bcm, with 83% as LNG and 17% via pipelines.

In addition, unconventional gas, most importantly shale gas and coal-bed methane (CBM) should play a growing role in the region's supply. While a more accurate estimate of these resources, as well as tests of their recoverability under environmentally acceptable conditions, remain to be performed, first evaluations are highly promising, with technically accessible figures, as quoted by IEA, of 36 tcm for China and 11 tcm for Australia.

A focus on China and India

In order to assess whether the growth in demand for natural gas in the group of importing countries will match new supply opportunities, let's focus on the two major countries where the penetration of natural gas in the energy balance has the greatest potential for increase, i.e. China and India.

China is currently the largest consumer of natural gas in the region, with a volume of 131 bcm in 2011 compared to Japan's 106 bcm, even though the share of gas in its energy balance is only 4%, against 17% in Japan. Demand in China is expected to reach 260 bcm in 2015 and could be as high as 520 bcm/year by 2035. This would result from a series of environmentally-friendly measures, in particular a massive conversion of coal power plants to natural gas, the development of pipeline and LNG imports and a significant contribution from shale gas.

India is the third largest consuming country in Asia-Pacific, with a volume of 61 bcm in 2011, of which 44 bcm came from domestic production and 17 bcm from LNG imports, mostly from Qatar. The share of natural gas in the energy balance is currently at a modest 11% level with, therefore, a massive potential for growth. Thus, most experts, including IEA, see gas demand in India rising to nearly 200 bcm/year by 2035.

Altogether, most experts expect gas consumption in the Asia-Pacific region to at least double over the next 20 years, from 590 bcm in 2011 to more than 1200 bcm in 2030, the share of gas in the primary energy balance of the region moving from 11% to 16%-17%, mainly at the expense of coal.

Regional gas trade

The entry of Asia-Pacific into the “Golden Age of Gas”, should provide new opportunities for the development of intra- and inter-regional gas trades, both by pipeline and as LNG. The present situation of the gas trade can be summarised as follows:

- ◆ Limited intra-regional pipeline trade of 30 bcm/year, mainly from Indonesia to Singapore and from Myanmar to Thailand;
- ◆ A single inter-regional pipeline trade, from Turkmenistan to China, of 14 bcm/year, through a new line commissioned in 2010;
- ◆ A very important flow of LNG trades, amounting to 207 bcm, which is equivalent to two-thirds of the global LNG trade, respectively supplied by Qatar (24%), Malaysia (16%), Indonesia (14%) and Australia (12%) to the following countries: Japan (52%), South Korea (24%), China, India and Taiwan (each with a share of about 8%).

This picture should change dramatically over the next 20 years, since we may expect extensive developments for existing and new trades.

The potential for exports from Turkmenistan and other countries in the Caspian area to China and India is extremely important. With 24 tcm of proved conventional reserves, Turkmenistan alone could export up to 100 bcm/year of gas in the medium term and, in a first stage, could increase the capacity of the existing pipeline to China to 40 bcm/year.

Russia is diversifying its export base from the historic markets in Europe to the Asia-Pacific region. Sakhalin LNG already supplies Japan, China and South Korea, while proposed new projects such as Yamal, Shtokman and

Vladivostok LNG are looking at Asia-Pacific markets. Furthermore, there are plans to develop a new pipeline export project from Siberia to China.

Whether natural gas is traded by pipeline or as LNG, long-term agreements are necessary to obtain project financing. This important characteristic differentiates gas from other fuels such as crude oil or coal. Such agreements have implications far beyond conventional sale and purchase relationships.

They imply long and complex negotiations, allowing the parties to become familiar with the culture and business environment of their counterparts and, potentially, to establish friendly links.

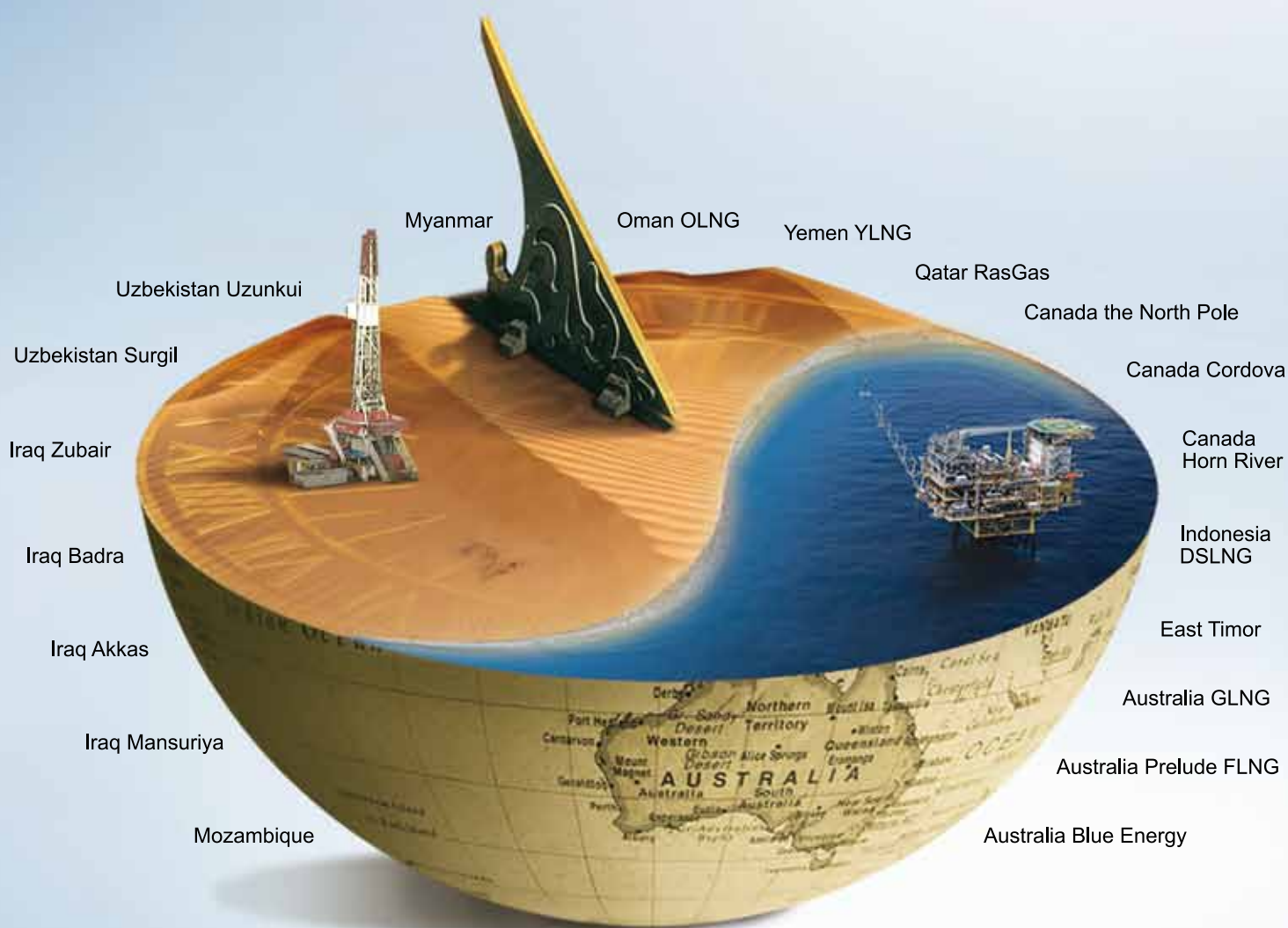
The weight of financing being borne by the seller and the buyer for their respective part of the investments of the gas chain means they have a common interest in avoiding confrontations and finding mutually acceptable settlements of their possible disputes.

By their size and geopolitical significance, natural gas and LNG projects require the consent, and often the support, of the governments of the seller’s and buyer’s countries and, in the case of pipeline gas, of the governments of the transit countries. Such projects therefore encourage the development of an inter-governmental dialogue that may in turn foster general trade relations and exchanges of other goods and services between the countries involved.

Finally, I would like to say that IGU has an important contribution to make in supporting the gas industry in Asia-Pacific. The 2012-2015 Triennial Work Programme aims at supporting the action of the industry in favour of the development of gas at the global level, towards governments, international institutions, policy-makers and opinion leaders, as well as facilitating the corresponding actions of IGU members in their respective countries.

Jérôme Ferrier is the President of IGU.

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First Council Meeting of the 2012-2015 Triennium

By Mark Blacklock

The IGU Council met in the Canadian capital last October, where business included the programme for the new Triennium, the final report of the Malaysian Presidency and the accession of five members.

The meeting was held in the Fairmont Château Laurier Hotel in Ottawa on October 18, 2012, following a geopolitics workshop and sessions of the Coordination Committee and Executive Committee on October 16-17. The whole event was hosted by the Canadian Gas Association and sponsored by the Canadian Association of Petroleum Producers, GE Oil & Gas, Enbridge, Talisman Energy and Spectra Energy. It was attended by 134 delegates and 18 accompanying persons.

Opening his first Council meeting as President, Jérôme Ferrier welcomed delegates and thanked the Canadian Gas Association for hosting the event at short notice. Cairo had originally been chosen as the venue but, in view of the security situation, it was agreed with the Egyptian Gas

Association that Cairo would instead host the Executive Committee meeting in March 2015.

Jérôme also thanked Canada's Deputy Minister of Natural Resources, Serge Dupont, who had addressed the Council dinner the previous evening, and the contributors to the geopolitics workshop, before giving the floor to the Secretary General, Torstein Indrebø.

After asking delegates to approve the minutes of the June 2012 Council meeting in Kuala Lumpur, Torstein announced that Hans Riddervold would be retiring from the Secretariat at the end of the year with Carolin Oebel, Senior Advisor to the Secretary General, taking over as Director. "Hans was instrumental in ensuring a smooth changeover to the Secretariat in Oslo and since then has taken charge of various initiatives," said Torstein. Later in the meeting, Hans was presented with an IGU diploma by Jérôme and the Immediate Past President, Datuk Abdul Rahim Hashim, gave him a gift from the Malaysian Presidency.

▶ Jérôme Ferrier was convening his first Council meeting as President.



Torstein went on to explain that Carolin joined the Secretariat in 2010 on a two-year secondment from E.ON Ruhrgas, which has agreed to extend her secondment to October 2014. "The secondment programme has been a great success and we invite applications from members proposing new candidates," he said; while Jérôme added, "the programme is mutually beneficial to IGU and the secondees".

Gas advocacy

The importance of IGU's gas advocacy initiative, which was launched during the Malaysian Presidency, has been underlined by the French Presidency's creation of a dedicated Task Force. Carolin briefed delegates on the initiative with a particular focus on the GasNaturally programme aimed at EU policymakers. "We joined with six other gas organisations (Eurogas, GERG, GIE, GIIGNL, Marcogaz and OGP) to enhance our gas advocacy work," she explained, "and we will continue this in 2013". She also covered cooperation with UNIDO, whose Director General, Dr Kandeh Yumkella is a member of IGU's Wise Person's Group, and has asked the Union to help with knowledge transfer and training to help people in developing countries switch from fuelwood to cleaner natural gas.

Events

Torstein then asked Ksenia Gladkova, Advisor to the Secretary General, to give a presentation on final preparations for the 3rd IEF-IGU Ministerial Forum in Paris, after which he gave details of IGU's participation in the UN Climate Change Conference (COP 18) in Doha. (These events are reported on elsewhere in this issue.)

Torstein went on to talk about the LNG X series of conferences and announced that a formal agreement had been drawn up with the other two sponsoring organisations, the Gas Technology Institute (GTI) and International Institute of Refrigeration (IIR). "GTI and IGU will alternate the chairmanship of the Steering



Committee with IGU running the secretariat, while IIR will chair the Programme Committee," he said. Torstein also announced that applications to host LNG 19 in 2019 had been received from China, Korea and Malaysia (Australia will host LNG 18 in 2016). The final decision will be made when the Steering Committee meets during LNG 17, which is being held in Houston, April 16-19.

Later in the meeting, Jay Copan, Executive Director of the LNG 17 National Organising Committee (NOC), gave an update on preparations for LNG 17 which is set to be the biggest gas event in 2013 with 5,000 participants from 80 countries expected.

An important event in 2014 will be the next IGU Research Conference (IGRC). Before Peter Hinstrup, President of the Danish Gas Technology Centre and the Conference Director of IGRC 2014 took the floor, Torstein gave a brief review of the last IGRC in Seoul in 2011 and thanked Robert Doets of the Royal Dutch Gas Association (KVGN) for donating the remaining funds held by the Foundation IGRC to IGU for the support of future events. (The Foundation had been set up the Dutch gas industry after The Netherlands hosted IGRC 2001.)

IGRC 2014 will be held in Copenhagen's Tivoli Congress Center, September 17-19, 2014,

▲ Canada's Deputy Minister of Natural Resources, Serge Dupont addresses the Council dinner.

▶ Ho Sook Wah, the former Chair of the Coordination Committee, giving the final report for the 2009-2012 Triennium.



with the theme “Gas Innovations Inspiring Clean Energy”. During his presentation, Peter said that the call for papers would be issued in November 2013 and that he was aiming to attract between 800 and 1,000 delegates. Invitations to host IGRC 2017 went out after the Ottawa meeting and the decision on who will host it will be made during the 2013 Council meeting in Beijing.

Regional Coordinators and Wise Persons Group

The day before the Council meeting, the Executive Committee appointed IGU’s Regional Coordinators. For this Triennium there are five, with a new Russia-Black Sea-Caspian region being created which is the responsibility of

Marcel Kramer, the CEO of South Stream, who was the Regional Coordinator for Europe and the CIS in the 2009-2012 Triennium. Khaled Abubakr, Managing Director of TAQA Arabia, was reappointed to cover the Middle East and Africa region and three new people were appointed: Kang Soo Choo, President & CEO of KOGAS and Chairman of Charter Member the Korea Gas Union, for Asia-Pacific; Luis Domenech, CEO of Comgás and President of the Brazilian Charter Member ABEGÁS, for the Americas; and Gertjan Lankhorst, CEO of GasTerra, for Europe. Kang Soo Choo, Luis Domenech, Marcel Kramer and Gertjan Lankhorst were introduced to those delegates who did not already know them while Khaled Abubakr sent apologies.

Jérôme then informed delegates that Tim Eggar was standing down from the Wise Person’s Group and that his place would be taken by Nobuo Tanaka, Global Associate for Energy Security and Sustainability at the Institute of Energy Economics in Japan.

He also announced that the Advisory Committee for Sustainability had been appointed by the Management Team (see *box*).

Malaysian report

Next up was Ho Sook Wah, the former Chair of the Coordination Committee, who gave the final report for the 2009-2012 Triennium. Pointing out that the Malaysian Presidency was one of the shortest in IGU’s history, at two years and eight months rather than a full three years, Ho said that the Malaysian team had had two main objectives. “Firstly, we wanted to make a difference and leave a legacy,” he said, “and secondly we sought to organise a successful and memorable World Gas Conference in Kuala Lumpur”.

A record total of 914 people served on the 13 technical committees and three task forces, and Ho paid tribute to their work. Highlights of the Triennium included the launch of IGU’s gas advocacy initiative, a new focus on human

Members of the Advisory Committee for Sustainability

- Torstein Indrebø, Secretary General (Chair)
- Georges Liens, Chair of the Coordination Committee
- Ho Sook Wah, Honorary Member of IGU
- Satoshi Yoshida, Chair of PGC A – Sustainability
- Timothy Egan, member of the Executive Committee, Canada
- Chris Gunner, member of the Executive Committee, Shell
- Xia Yongjiang, member of the Executive Committee, CNPC
- Carolin Oebel, Director, IGU Secretariat (Secretary)

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capital and youth development, greater interaction with policymakers and the appointment of Regional Coordinators, while membership continued to grow and IGU's new logo was introduced. "It has been a very exciting and enjoyable journey," he summed up.

Ho was followed by Zahariah (Liza) Abdul Rahman, CEO of WGC2012, who gave a synopsis of the final report on the 25th World Gas Conference. A copy of the full report was distributed to delegates.

TWP 2012-2015

After the coffee break, Georges Liens, Chair of the Coordination Committee, gave a presentation on the Triennial Work Programme (TWP). "Our Malaysian colleagues have set the level very high for us," he declared. Georges said that so far 678 people from 41 countries had volunteered to serve on the technical committees with more expected, and that the Coordination Committee had developed an extranet collaborative platform to enable committee members to communicate and share their work. The first progress report of the TWP is on pages 93-128.

Daniel Paccoud, Chair of the NOC for the 26th World Gas Conference, then gave a short overview of plans for the event which will be held in Paris, June 1-5, 2015.

New members

Applicants for IGU membership always have the opportunity of addressing the Council, but before inviting the prospective members to speak Jérôme gave the floor to António Pires of Associação Portuguesa das Empresas de Gás Natural (AGN). This new association's application to take over as Portugal's Charter Member had been approved at the Council meeting in Kuala Lumpur in June 2012, but a tight schedule meant there was no time for AGN to give a presentation.

António Pires introduced AGN to delegates and he was followed by representatives of four

of the five applicants. Azerbaijan, Albania and Côte d'Ivoire were applying for Charter Membership and Colombia was seeking to rejoin IGU, while Repsol was applying for Associate Membership.

The representatives were: Eda Gjergji, Chief of Foreign Relations of the Albanian Energy Regulatory Authority (ERE); Eduardo Pizano de Narváez, President of Naturgas, Asociación Colombiana de Gas Natural; Roland Abrogouah, Technical Advisor to the CEO of Société Nationale d'Opérations Pétrolières Côte d'Ivoire (PETROCI); and Jorge Gómez de la Fuente LNG Projects Portfolio Manager of Repsol. The State Oil Company of the Azerbaijan Republic (SOCAR) sent apologies.

Delegates then approved the five applications giving IGU a new total of 121 members (82 Charter and 39 Associate) from 80 countries. The Secretariat is continuing its efforts to increase membership under IGU's marketing plan, particularly in Africa, the Caspian region and Latin America.

Torstein went on to present the IGU budget for 2013, which was approved by the Council, and said that the membership fee would be held at €5,000. He also announced that IGU's website was being redesigned and asked Sjur Bøyum, Communication Manager & Webmaster, to brief delegates.

Reports and diplomas

After lunch, representatives of two affiliated organisations gave reports. Alicia Milner, then Deputy Chair (now Chair) of NGV Global and President of the Canadian Natural Gas Vehicle Alliance, reviewed the recent development of the NGV sector and future opportunities, while Daniel Hec, Secretary General of Marcogaz briefed delegates on the European Gas Technology Conference (EGATEC 2013) which will take place in Paris, May 30-31.

Traditionally members of the technical committees and Secretariat have had their work recognised with an IGU diploma. Now, those



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▶ Alicia Milner of NGV Global gave one of the reports from visiting organisations.

who have served two or more terms on the Executive Committee, as Regional Coordinators and as members of the Wise Persons Group are also recognised. Jérôme presented IGU diplomas to Domenico Dispenza (Executive Committee 2003-2012), João Carlos de Luca (Executive Committee 2006-2012), Ieda Gomes (Executive Committee 2006-2012) and Hans Riddervold (Director in the IGU Secretariat

▶ IGU diplomas were presented to several people including Ieda Gomes (BELOW) and Domenico Dispenza (OPPOSITE BELOW).



2007-2012). A diploma for David Parker (Executive Committee 2006-2012) was accepted by Dave McCurdy on his behalf while James Kwan (Regional Coordinator 2009-2012) and Tim Eggar (Member of the Wise Persons Group 2003-2012) could not attend and their diplomas were presented after the Council meeting.

Torstein gave information about future meetings and then Li Jian Xun, General Secretary of the China Gas Society, gave a short presentation on Beijing, the venue for the next Council meeting.

Canadian gas industry

The final session was dedicated to three presentations on the gas industry in Canada, which is the world's third largest producer of natural gas.

Sam Shaw, Vice President Natural Gas Policy for Encana looked at Canada's unconventional gas (UCG) resources with a focus on shale gas. The country's UCG resources are estimated at between 20 and 36 tcm so UCG, which currently accounts for about 45% of Canadian production, has significant potential for further growth. However, new export markets in Asia-Pacific will have to be developed as the US is now oversupplied. He identified raising investment finance and environmental stewardship as the major challenges.

Tim Kennedy, Vice President Federal Government Affairs at Spectra Energy and also representing the Canadian Energy Pipeline Association (CEPA), looked at the development and operation of Canada's 72,000km pipeline system. He explained that public perception of the pipeline industry is a big issue in Canada and told delegates how CEPA is addressing this through its Integrity First programme. The aim is to strengthen the foundation for the industry's licence to operate and grow.

Timothy Egan, President and CEO of the Canadian Gas Association, gave an overview of the domestic market and looked at opportunities to expand it, stressing the importance of gas advocacy and technical innovation. Noting that the UCG revolution has increased



the affordability of gas, he said the challenge was to deepen the appreciation for gas by promoting all its attributes such as lower emissions, reliability, versatility and safety. “We need to constantly work at improving how we say what we do,” he declared.

As the most senior Honorary President present, Datuk Rahim ended the proceedings with a vote of thanks to the Canadian hosts.

The day was rounded off by a farewell dinner in the National Arts Centre. With the theme “Now We’re Cooking with Gas”, award-winning Canadian chefs Michael Blackie and François Gagnon demonstrated how to prepare the delicious five-course meal enjoyed by delegates.

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

▲ Timothy Egan, President & CEO of the Canadian Gas Association welcomed delegates to the farewell dinner with the theme “Now We’re Cooking with Gas”.

▲ Award-winning chefs Michael Blackie (right) and François Gagnon (left) with “pupil” Luis Domenech, IGU’s Regional Coordinator for the Americas (centre).



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Gas Recognised as a Destination Fuel at 3rd Ministerial Gas Forum

By Ksenia Gladkova

The success of the 3rd Ministerial Gas Forum confirmed the biennial event's status as an outstanding arena for ministers and industry leaders to discuss key challenges faced by the gas industry worldwide.

The Forum – co-organised by IGU and the International Energy Forum (IEF) – took place in Paris, France, on November 16, 2012 under the theme “Call for Sustainable Energy Policies and Improved Cooperation – Enhancing the Role of Natural Gas”. Held under the Chatham House Rule, it stimulated an open and productive debate on the place of natural gas in the sustainable energy future.

Attended by ministers, government representatives, industry leaders from gas producing, consuming and transit countries, international organisations and experts from developed and developing countries, the Forum confirmed the growing desire for dialogue and cooperation in

the energy sphere. It was organised as two panel sessions, each followed by open round-table discussions. In the morning session nine speakers considered recent international developments – new challenges and new opportunities for gas, while in the afternoon session 10 speakers addressed enhanced dialogue and cooperation for strengthened energy security. Both sessions were moderated by the Right Honourable Tim Eggar, Chairman of Cape plc, in his last service to IGU before standing down as a member of the Wise Persons Group.

Keynote addresses

In her opening address, the French Minister of Ecology, Sustainable Development & Energy, Delphine Batho related the national energy debate taking place in France around two main topics: the composition of the future energy mix and how to deal with market volatility.

▼ The 3rd Ministerial Gas Forum allowed ministers and industry leaders to discuss key challenges faced by the gas industry.



▼ The Forum was organised as two panel sessions.



She underlined the importance of diversifying energy sources and mitigating climate change despite the economic slowdown. She noted the ongoing debate on gas price indexation in France and stressed the importance of long-term contracts for security of supply. Natural gas is a good low-CO₂ substitute for other fuels, contributes to energy efficiency and meets the power generation sector's need for flexibility, she said, but an increase of its share in the energy mix brings challenges.

In his opening remarks, IGU President, Jérôme Ferrier stressed the importance of the Forum as an opportunity to formulate proposals for the development of energy policies involving long-term partnerships and new models of cooperation between stakeholders. IGU and IEF promote natural gas not only as a transition fuel, but as a long-term component of the global energy mix and a key pillar in building a sustainable energy future.

IGU Secretary General, Torstein Indrebø noted that today's energy policies need to address three complex and often contradictory objectives at the same time: energy security – both for suppliers and consumers, economic development and environmental sustainability. An alignment between the policies and market

▼ Delphine Batho, French Minister of Ecology, Sustainable Development & Energy gives the opening address as Jérôme Ferrier, IGU President and Torstein Indrebø, IGU Secretary General listen.



Speakers

Morning Session

- ◆ Youcef Yousfi, Minister of Energy & Mines, Algeria
- ◆ Mark Corey, Assistant Deputy Minister, Energy Sector, Natural Resources Canada
- ◆ Maria van der Hoeven, Executive Director, IEA
- ◆ Ichiro Takahara, Director General, Agency for Natural Resources & Energy, Ministry of Economy, Trade & Industry, Japan
- ◆ Christophe de Margerie, Chairman & CEO, Total
- ◆ Alexander Medvedev, Deputy Chairman of the Management Committee, Gazprom
- ◆ Andrew Brown, Director, Upstream International, Shell
- ◆ Rob Cole, Executive Director, Woodside
- ◆ Alejandro Martínez Sibaja, Director General, Pemex Gas & Basic Petrochemicals

Afternoon Session

- ◆ Mohammed Saleh Al-Sada, Minister of Energy & Industry, Qatar
- ◆ Peter Chin Fah Kui, Minister of Energy, Green Technology & Water, Malaysia
- ◆ Fouad Douiri, Minister of Energy, Mining, Water & Environment, Morocco
- ◆ Mohamed Lamine Chakhari, Minister of Industry & Technology, Tunisia
- ◆ Daniel Poneman, Deputy Secretary of Energy, United States
- ◆ Verónica Irastorza Trejo, Under Secretary of Planning & Energy Transition, Ministry of Energy, Mexico
- ◆ Gérard Mestrallet, CEO, GDF Suez
- ◆ Klaus Schäfer, Chairman of the Board of Management, E.ON Ruhrgas
- ◆ Gertjan Lankhorst, CEO, GasTerra
- ◆ Jean-Arnold Vinois, Director, Directorate-General for Energy, European Commission

forces is vital, he stated. This requires partnerships between governments and businesses, and a global framework of policies that support and facilitate investments with a long-term perspective.

IEF Secretary General, Aldo Flores-Quiroga noted the importance of transparency for market stability and confirmed that IEF and its partners in the Joint Organisations Data Initiative (JODI) have committed to create a JODI-Gas database modelled on the same concept as the existing JODI-Oil model. The system is expected to be available to the public during the second half of 2013.

Main topics discussed

Environmentally-friendly properties of gas

Governments should express that gas is abundant, reduces CO₂ when substituting for coal and does not have an issue with supply security. When substituting for other fossil fuels, gas can immediately offer a substantial reduction of

CO₂ emissions as well as a considerable decrease in other pollutions (NO_x, SO_x etc.).

Gas as a partner for renewables

Renewable energies need gas as a partner for their development. Using natural gas as a base-load fuel offers the solution to the intermittent character of solar and wind power generation. Gas will be the “backbone” of the future energy mix in combination with renewables.

Gas for transportation

Governments have a key role in fostering the creation of a network of natural gas service stations to support the development of a large fleet of commercial natural gas vehicles.

Gas as part of the energy mix

One of the strong messages relayed by the speakers is that all types of energy are needed to satisfy growing global energy demand. Natural gas will play a significant role in the

▼ Maria van der Hoeven, IEA Executive Director makes a point to Youcef Yousfi, Algeria's Minister of Energy & Mines (*left in the picture*) and moderator Tim Eggar (*far left*)

future energy mix. The industry should intensify efforts to promote energy transition based on gas and also to advocate gas as a valuable part of the sustainable energy mix. Natural gas is a transition and a destination fuel. The demand for natural gas will increase 50-60% by 2030.

Place of gas in energy policies

CO₂ prices have to be brought to a level sufficient to impact energy choices. The gas industry needs to cooperate with renewables, make carbon capture and storage technology work and broaden the use of gas for transportation. Investments are needed from the industry but governments have a crucial role to play in preparing the legal and regulatory ground for these investments and ensuring favourable business conditions. Special attention should be paid to the creation of a stable regulatory and fiscal environment for shale gas production.

Gas pricing and markets

Three regions with different gas pricing mechanisms exist: North America, Europe and Asia. LNG supplies have to be competitive in order to stimulate development of a global gas market. The industry needs correct pricing of gas with respect to competing fuels, in particular to coal, in terms of price level, indexation, price revision mechanism etc. The EU's Emissions Trading Scheme (ETS) should be adapted to this reality and better reflect the merits of natural gas for base-load electricity generation and as a complement to renewable energies.

Importance of long-term contracts for natural gas

Several speakers underlined the importance of long-term contracts for gas as a reliable risk-sharing mechanism. The large investments required by the industry should be supported by long-term commitments from market players. However, the short-term markets may



be seen as a useful complement to the long-term commitments.

EU energy policy

The outstanding effort made by the EU to create a common energy policy was noted. The EU has improved security of supply by integrating its 27 member countries into a common market. Energy efficiency and the use of

▼ Alexander Medvedev, Deputy Chairman of Gazprom's Management Committee addresses the Forum. Next to him are Alejandro Martínez Sibaja, Director General, Pemex Gas & Basic Petrochemicals (*centre*) and Christophe de Margerie, Chairman & CEO of Total (*right*).



renewable energies are to be further promoted. In the European market, natural gas should find the right place with respect to coal and renewables. A renewables-only policy is not realistic. In the context of ambitious targets to reduce CO₂ emissions, natural gas has to take over coal's part in the energy mix.

Industry leaders highlighted the increasing importance of dialogue and cooperation bet-

ween the EU and its major partners such as Algeria, Norway, Qatar and Russia. Long-term visibility of the regulatory environment is needed to attract necessary investments, using a market-based approach.

Unconventional gas

Unconventional gas is a game-changer. In order to invest, companies need a clear vision of the

Concluding Statement of the 3rd IEF-IGU Ministerial Gas Forum

Government representatives and industry leaders reviewed recent developments in the gas sector and discussed the increased importance of sustained energy policies, long-term partnerships and enhanced cooperation in helping to address the complex challenges facing the natural gas industry.

The discussions focused on the following topics:

Recent developments and long-term prospects in gas markets

- ◆ Global natural gas consumption and trade have been growing steadily over the past two decades and gas has strengthened its position in the world energy mix, supported by its attractive economic and environmental characteristics and the development of gas infrastructure.
- ◆ With Asian economies on the rise, gas demand is undergoing structural change tipping the global trade balance away from traditional OECD demand centres and towards Asia.
- ◆ The rapid growth of unconventional gas production in the US has altered gas market dynamics and is expected to impact the outlook for gas markets worldwide.

- ◆ In the US the low price of natural gas has made gas preferable to coal for use in power generation and at the same time in Europe coal has been displacing gas-fired power generation in spite of EU climate policies.
- ◆ The Fukushima accident has given cause for many countries to review their energy policies. The potential adverse impact on the development prospects of nuclear power around the world may have significant implications for gas demand.
- ◆ Under all forecast scenarios, gas demand is projected to grow significantly and the volume of gas traded internationally is set to increase. Natural gas reserves are abundant and the industry has a solid track record of continuing to discover, develop and produce natural gas reserves.
- ◆ More than 80% of the projected increase in natural gas demand by 2035 is expected to come primarily from non-OECD countries, mainly in Asia and the Middle East.

Investment and energy policies

- ◆ Worldwide gas resources are sufficient to meet projected demand for the coming decades; however, huge investments are required throughout the entire

value chain to produce and deliver natural gas to end-consumers.

- ◆ According to recent estimates, the cumulative investment needed to meet projected gas demand for the period 2011-2035 amounts to \$9.5 trillion, or an annual average of \$380 billion. Making those huge investments a reality represents a major challenge for the gas sector, especially in light of the numerous uncertainties that impact investment decisions.
- ◆ Sustained energy policies and stable fiscal regimes contribute toward reducing uncertainties in the investment framework, and enable the gas industry to plan and invest in new capacity.
- ◆ Improved communication and cooperation within the industry and with other stakeholders, including governments, and the general public should help to ensure the on-going development of natural gas, and global energy security.
- ◆ More than one billion people live without access to electricity. This is both the result and cause of poverty. Natural gas is well positioned to play a more important role in mitigating global energy poverty and to support the "Sustainable

future price and of the estimated return on investment. The development of shale gas technology should be carried out in parallel with achievements in new conventional gas production.

Next Forum

The inaugural IEF-IGU Ministerial Gas Forum took place in Vienna, Austria in 2008, with

the second being held in Doha, Qatar in 2010. Following the success of the latest Forum in Paris in 2012, the 4th Ministerial Gas Forum is set for late 2014. Full information will be available in due course on the IGU website.

Ksenia Gladkova is Senior Advisor to the Secretary General.

Energy for All" initiative launched in 2012 by UN Secretary General Ban Ki-Moon.

Improved market transparency

- ◆ Transparency and availability of data are increasingly important factors in determining the smooth functioning of gas markets. Improving the availability, quality and timeliness of gas market data will contribute toward reducing uncertainties, improving predictability and facilitating project planning.
- ◆ The efforts made by IEF and partner organisations to extend the Joint Organisations Data Initiative (JODI) to cover natural gas data were strongly encouraged.

Regional gas markets and pricing mechanisms

- ◆ Regional markets are still disconnected and the prospect for a global gas market has not yet materialised despite increased LNG trade. There are still significant variations between regional market structures and gas prices are still determined by their respective regional dynamics.
- ◆ Trading at Europe's hubs increased over the past decade; however, hub-based spot prices currently

suffer from a lack of liquidity and excessive volatility.

- ◆ Long-term contracts continue to be an integral component of well-functioning gas markets, as they deliver long-term visibility and security to both gas suppliers and consumers. Gas suppliers benefit from long-term contracts which help to justify the significant burden of financing the development, processing and transportation infrastructure. Gas consumers also benefit from a security of supply standpoint.

Intergovernmental cooperation and industry partnership

- ◆ As global gas trade and interdependence among producing and consuming countries increases, there is a need for enhanced cooperation and dialogue between producers and consumers. Multilateral agreements and intergovernmental solutions will be needed to support new infrastructure developments, to jointly explore and exploit new gas reserves, and to help establish robust and secure markets to the benefit of all parties.
- ◆ As natural gas demand rises, NOC-IOC partnerships based on gas are expected to grow. Stronger partnerships, multifaceted cooperation

and innovative arrangements between NOCs and IOCs are expected to deepen particularly in the face of challenges related to the development of remote and difficult gas resources.

- ◆ Integrated gas projects provide examples of successful long-term relationships between NOCs and IOCs. The relationship covers the whole value chain: from resource development to gas transportation and transformation to downstream, marketing and development of local skills.
- ◆ NOCs and IOCs may explore new models of cooperation that go beyond simple resource development and involve integrating a host nation's expectations, such as economic development, environmental protection, development of infrastructure, technology, NOC capabilities and the local workforce.
- ◆ Access to markets, technology, capital and resources can offer mutually beneficial opportunities for cooperation. Cross-investment throughout the gas value chain, based on mutual trust and respect, and vertical and horizontal integration may serve to strengthen long-term relationships between NOCs and IOCs.

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ANCIENT WISDOM GIVES

Rich in natural gas resources, China has seen natural gas demand increase rapidly in tandem with its expanding economy. This situation has brought both challenges and opportunities for the industry in recent years. China Gas Society and the China Gas Association are committed to fostering technological innovation and the favourable development of China's gas industry. Our members come from government, regional associations, R&D institutes, universities, gas companies and related enterprises, with leading experts working in teams that cover all fields of the gas industry. We promote the development of clean burning natural gas for a sustainable energy supply which contributes to a healthier environment on earth.



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News from Organisations Affiliated to IGU

Here we have reports from the Energy Delta Institute (EDI), Gas Technology Institute (GTI), International Group of LNG Importers (GIIGNL), International Pipe Line & Offshore Contractors Association (IPLOCA) and NGV Global, while Marcogaz – Technical Association of the European Natural Gas Industry has contributed a separate article on EGATEC 2013.

Energy Delta Institute

By Steven von Eije

On December 7, 2012, Energy Delta Institute (EDI) organised the first edition of the Eurasia Dialogue in Moscow. EDI cooperated with Energy Academy Europe, the Institute of World Economy and International Relations (IMEMO) and Gubkin Russian State University of Oil and Gas to stage the high-level event, which was attended by around 180 participants from all over the world. The theme was “Securing security of demand for Russian gas”.

▼ The first edition of the Eurasia Dialogue took place at the IMEMO conference hall in Moscow.

The first presenter was Tatiana Mitrova, Head of the Global Energy Department at the Skolkovo Energy Centre. Ms Mitrova painted a grim picture of future EU demand for Russian gas. Growth is limited in all sectors, she said, the carbon market is failing and gas is losing out to coal in power generation. In 2020, there will only be 17 bcm of uncontracted gas volumes that suppliers can compete for. Ms Mitrova concluded that there is much uncertainty with regard to EU demand for Russian gas and that there will be increasing competition between gas suppliers in the future. Finally, she warned that optimistic forecasts may result in oversupply and overinvestment.

The second speaker of the day was Mikhail Korchemkin, Managing Director of East European Gas Analysis. He was critical of Gazprom’s strategy and wondered whether or not the company could remain profitable. According to Mr Korchemkin, Gazprom is not following the



principle of selling gas first and then building pipelines, and is currently overinvesting in pipeline capacity. He added that Gazprom is using more assets to sell less gas, and that this strategy is bound to fail. He explained that high forecast gas demand in 2030 does not warrant the building of pipelines today. Finally, he said that Gazprom is losing market share because it wants to sell gas at excessively high prices, highlighting that nowadays even Algerian gas is cheaper. His presentation was followed by a fierce discussion; clearly not everyone shared his point of view.

Next up was Eric Dam, EDI President, who looked at security of capacity. He started by reassuring the Russian delegates that the EU will need Russian gas in the future. He also reacted to Mr Korchemkin's presentation, pointing out that idle pipelines are sometimes needed in order to be able to exploit arbitrage opportunities.

Mr Dam identified three major challenges to security of capacity: fragmentation, the investment climate and the NIMBY (not in my backyard) effect. He said that fragmentation is mainly due to unbundling and in his personal opinion the old system was more effective because one could first sell the gas and then build the pipeline. According to Mr Dam there is a competition underway between regulators, resulting in low tariffs which are set for only five years, while a pipeline investment is for a much longer period. In order to address the NIMBY challenge stronger political support is required. Companies should involve the public more; "if you explain what you are doing and why you are doing it, it will be easier to convince them," he said.

The fourth presentation was given by Sergei Komlev, Head of the Contract Structuring & Price Formation Directorate at Gazprom Export, on pricing principles for European gas markets. According to Mr Komlev, oil indexation in long-term gas contracts is a fair pricing mechanism which is beneficial to EU gas customers and the



◀ The Eurasia Dialogue was one of the first events organised as part of EDI's new Joint Excellence Strategy.

premium paid reflects the value of the flexibility that is offered. He said that hub prices are not an adequate indicator of the actual price in the EU because the hubs are not liquid enough to provide all the gas. Moreover, this limited liquidity means that hub prices could be manipulated.

Mr Komlev added that the system is out of balance: for gas infrastructure there is a maximum regulated return of 6% while renewables are subsidised to a return of 18%. His presentation was also followed by a fierce discussion.

After lunch, Henrik Valgma, Head of Portfolio Management & Trading at Dong Energy, presented the market vision of an EU energy company, explaining that Dong Energy has a low-carbon profile but this is currently resulting in a loss. He said that natural gas supplies from different countries are actually beneficial to Russia as they make Russian gas more acceptable due to increased security of supply. He went on to say that the margins on natural gas sales are becoming too small for the associated risks. In the pre-unbundling period all the risks could be transferred to the end customers. He wondered who should carry the risk in the new situation, adding that Dong Energy was not in a position to do so.

After the presentation Mr Valgma was asked why Dong Energy changed to a low-carbon portfolio. He explained that this was a combination between a lack of natural resources and a strong political will to change the system and find a new competitive edge for Denmark.

Mr Eremin of Gubkin Russian State University of Oil and Gas continued with a presentation on the regulatory regime covering EU-Russia energy cooperation. According to Mr Eremin, recent regulatory changes in the EU have created more uncertainty and higher risk for Russian gas suppliers. He concluded that serious efforts and compromises would be required from both sides to reach a win-win situation.

The next presenter was Dr Andrey Konoplyanik, Professor at Gubkin Russian State University of Oil and Gas. He looked at the post-2009 situation in the European gas market, indicating that there are four main challenges and risks for Russian gas: lower demand, increasing supplier competition, increased investment risks and a political desire on the part of the EU to reduce dependency on Russian gas. Dr Konoplyanik went on to explain the fundamentals of gas pricing and the various possible options. Finally, he suggested that the best new gas pricing method in the EU would be one using indexation, but based less on petroleum products and more on spot prices and competing fuels such as coal and renewables.

Dr Stanislav Zhiznin, Professor at the Moscow State Institute of International Relations, was the final speaker. He warned about underinvestment in production capacity. Furthermore, he indicated that it is important to find the right balance between commercial and political interests. He noted that the President of Russia has stated that he wants to create additional jobs within the gas sector, which is not necessarily consistent with commercial objectives.

The Eurasia Dialogue was one of the first events realised as part of EDI's Joint Excellence Strategy. Under this new strategy, EDI organises courses and events in cooperation with presti-

gious international academic institutions and business partners.

The first edition of the Eurasia Dialogue was a great success. It was a good platform to exchange views between East and West. The event was attended by many high-level business executives, who had the opportunity to meet each other in a different setting.

The Eurasia Dialogue presentations and video interviews with the speakers are available on the online community for energy professionals: www.syntropolis.net.

Steven von Eije is an Energy Analyst at the Energy Delta Institute (www.energydelta.org).

Maintaining a Safe and Intelligent Pipeline Infrastructure

By Alicia Farag

A safe, reliable, and more intelligent infrastructure is critical to match abundant supply with growing gas demand. To support and enable this, the natural gas industry is progressing towards mobile, geospatially enabled data collection for asset tracking and traceability, risk analysis and regulatory compliance.

Gas Technology Institute (GTI), along with technology development partner 3-GIS, is developing a suite of mobile technologies that automate field data collection processes to increase efficiencies and improve data quality.

One example is GTI's Asset Lifecycle Tracking technology that uses barcode scanning, geospatial information system (GIS) software and tablet computers with real-time sub-foot accurate global positioning system (GPS) to record new installations. The technology creates GIS features directly in the field and populates asset attributes automatically with information contained in barcodes. The collected data is available immediately for integration into the GIS in the office through cloud computing. Pilot projects of the Asset Lifecycle Tracking technology started in 2012 and will continue through the first half of 2013.



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▶ Sub-metre accurate GPS providing data to a tablet computer running GIS-enabled software.

This same technology is also being deployed for other operations. GTI completed two pilot projects to use tablet computers and high-accuracy GPS to map the location of radio frequency identification (RFID) tags installed as part of pipe rehabilitation projects. A pilot project in New York will use the technology to track excavation activity to ensure that digging activities are not occurring near underground pipes.

A recently published report, *Intelligent Utility Installation Process*, provides a methodology for field data capture during installations of new natural gas infrastructure. It includes recommendations on asset data to be collected, an innovative methodology for data capture and documentation, and technologies to be used to reduce or eliminate the opportunity for human error.

The report was sponsored by Operations Technology Development (OTD), a partnership of North American natural gas distribution companies formed to develop, test and implement new technologies, and additional details can be found on their website at www.otd-co.org. Another OTD project is establishing guidelines for data collection requirements to ensure

that the data needed for threat identification and risk modelling is available for integrity management programmes.

In 2010, GTI commercialised a software application that uses GPS to track leak survey routes and automatically associates the routes with pipe segments for accurate reporting. The software is now available through Ubisense as *VeroTrack Automated Survey Tracking (AST)*. In May 2011, Idaho-based Intermountain Gas Company, the first company to fully implement *VeroTrack*, reported a 20% efficiency gain in the field operations portion of the leak surveying process, and the overall return on investment is estimated at 33%.

With a focus on technology and information development geared toward improving integrity management, reducing risk, preventing damage and enhancing operational efficiency, GTI is providing operators with enhanced tools, processes and best practices to collect and manage their data most efficiently.

Alicia Farag is a Senior Engineer in the Infrastructure Sector at GTI — a leading research, technology development and training organisation solving important energy and environmental challenges for the global natural gas and energy industry for more than 70 years (www.gastechnology.org).

GIIGNL: Securing the Future of LNG Trade

By Jean-Yves Robin

During its General Assembly in Madrid in September 2012, GIIGNL – the International Group of LNG Importers – elected Domenico Dispenza as its new President. Domenico Dispenza succeeded Jean Vermeire, who had held the position since 2006 but whose mandate had reached its statutory limit. Three members joined the Group in 2012: Dunkerque LNG, JX Nippon Oil and Vopak LNG.

In 2013, GIIGNL will complete its 42th full year of activity, and since its foundation soon after the birth of the LNG industry in 1971 in



▲ *VeroTrack Automated Leak Survey* software running on a Trimble Juno mobile device.

Paris, its membership has grown to 68 companies worldwide, comprising nearly all companies active in LNG imports or in the operation/ownership of LNG import terminals.

As a non-profit organisation, GIIGNL derives its resources from membership fees only. The Group constitutes a forum for exchange of experience among its members with a view to enhance the safety, reliability and efficiency of LNG import activities and the operation of LNG import terminals in particular. To this end, GIIGNL members share information about commercial and technical developments in LNG, including safety incidents at member facilities.

A common goal shared by GIIGNL members is to promote the development of activities related to LNG: purchasing, importing, processing, transportation, handling, re-gasification and its various uses.

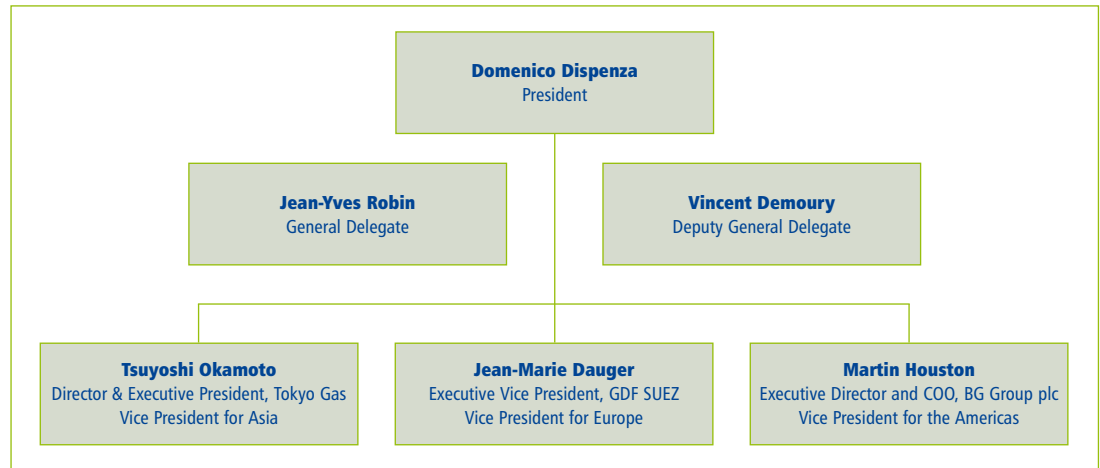
GIIGNL does not exchange information on the specific economic activities of its members, their employees and host governments unless such information is available publicly, nor does it make recommendations for specific products and services.

From a geographical perspective, GIIGNL members are located in the main three LNG importing zones: Europe (30 members), Asia (28) and the Americas (10). The Group is governed by an Executive Committee which is comprised of 12 members elected by the General Assembly for a two-year mandate. Executive Committee members convene annually in the spring and the whole membership holds its General Assembly annually in autumn.

Every year, GIIGNL conducts a wide survey amongst its members in order to publish *The LNG Industry*, a global statistical report which is recognised as a reference source for primary data on LNG. The report covers the whole LNG chain, from key developments in the liquefaction sector to the latest news regarding regasification facilities and LNG shipping. It includes an update on LNG contracts and provides a detailed overview of world LNG flows, including a focus on spot and short-term imports. The LNG Industry report and its previous editions are publicly available free of charge on the GIIGNL website: (www.giignl.org).



GIIGNL works to enhance the safety, reliability and efficiency of LNG import activities.



► GIIGNL is overseen by six executives, three drawn from member companies.

Within GIIGNL, two Standing Study Groups formed by experts drawn from the most experienced member companies also address research topics of common interest to the LNG community.

On the technical side, the Technical Study Group comprises technical specialists including design engineers, researchers, safety managers and operations managers. The group gathers information on technical and operational subjects of interest and prepares definitive reports and recommendations for the whole GIIGNL membership. For studies for which expertise could be widened, external specialists may be temporarily co-opted into the group and consultants may be employed. Since its foundation, the Technical Study Group has published a wide range of reports on themes such as LNG Quality and Compatibility, Safety Systems, Reliability, Ageing and Life Extension of LNG Installations, Rollover in LNG Storage Tanks and Emissions to the Environment from Import Terminals. A reference for the industry is the *LNG Custody Transfer Handbook*, which is now at its third update. Based on the measurement methods most used by GIIGNL members, this handbook has been regularly improved to include the most up-to-date standards and best practices for measuring the energy transferred in the context of LNG sales and purchase agreements (SPAs).

On the commercial side, the Commercial Study Group also comprises specialists with a broad range of skills including commercial managers, analysts, negotiators and contract specialists. With due respect to anti-trust rules, the GIIGNL Commercial Study Group has defined a series of reference Master Agreements (Ex-Ship and FOB SPAs, Time Charter Party, Voyage Charter Party, to quote some) intended to facilitate the preparation of contract documentation for LNG trades. More recently, the Commercial Study Group has initiated a new study on LNG as a Marine Fuel and Retail LNG, in coordination with the Technical Study Group.

In addition, GIIGNL supports the exchange of information and relevant studies with associated organisations that have similar interests and undertake similar activities in order to benefit the LNG industry, namely IGU, the Center for LNG (CLNG), Eurogas, Gas LNG Europe (a division of GIE), GTI, IEA and the Society of International Gas Tanker and Terminal Operators (SIGTTO). The Group pays close attention to coordinating with other international bodies in order to avoid duplicating research efforts. With the same objective of promoting gas and LNG activities, GIIGNL joined GasNaturally, a European gas advocacy initiative directed at European policymakers (www.gasnaturally.eu).

Building on more than 40 years of activity and given the challenges ahead, GIIGNL intends to continue to develop and share best practices with the LNG community. Among the top priorities is a specific focus on safety, as the adherence to the highest standards and adequate information exchange in this domain is essential in order to maintain the excellent safety record within the industry, itself an absolute condition for its continued success.

Jean-Yves Robin is General Delegate of GIIGNL (www.giignl.org).

IPLOCA Expands

By Doug Evans

IPLOCA continues to gain both new Regular Members and new Associate Members with a total membership of more than 260 companies. The reach of the Association is also expanding via its regional meetings (held in 2012 in The Netherlands, Italy and Colombia), with excellent attendance and commitment at each. While the Annual Convention brings members together from all over the world, the regional meetings are an opportunity for companies to meet their Association colleagues in smaller groups, to



◀ IPLOCA's Board of Directors for 2012-2013.

From left to right in the front row: Najib Khoury, Doug Evans, Osman Birgili, Harald Dresp, Juan Arzuaga (IPLOCA Executive Secretary);

Second row: Raul Vilugron, Greg Miller;

Third row: Iosif Panchak, Karl Trauner, Kaan Dogan, Leonardo Gravina;

Fourth row: Jésus Garcia Pons, Jan Koop, Bruno Maerten, Ibrahim Zakhem, Marco Jannuzzi, Jean-Claude Van de Wiele;

Fifth row: Adam Wynne Hughes, Andy Ball, Pierluigi Zanin, Jerrit Coward;

Sixth row: Michael Rae, Sandip Sharma, Scott Summers, Wilhelm Maats;

Not pictured: Andy Lukas.

▼ Adam Wynne Hughes (left) presenting the IPLOCA Health & Safety Award to Brad MacLean (centre) and Jerrit Coward.



the “IPLOCA Pipeline Construction Safety Instructors Tool”, designed to assist with the training of pipeline workers worldwide. This DVD is being made available to the membership at large.

IPLOCA’s involvement with research spear-headed by the Pipeline Research Council International (PRCI) continues, and the Association remains committed to furthering pipeline-specific research that will benefit all of its members, including ongoing development, via a wiki, of the publication *Onshore Pipelines: The Road to Success*.

More than 680 delegates attended IPLOCA’s 46th Annual Convention, which was held in Istanbul, September 10-14, 2012.

During the event, the Association elected its Board of Directors for 2012 to 2013. Named to positions on the IPLOCA Board of Directors are the following:

Officers

President of IPLOCA and Director for America

North: Doug Evans (Gulf Interstate Engineering)

1st Vice President and Director for Middle East & Africa: Najib Khoury (CCC)

Treasurer and Director for Europe Central: Harald Dresch (Max Streicher)

Immediate Past President: Osman Birgili (Tekfen Construction)

Regional Directors

Director for Europe Central: Jan Koop (Bohlen-Doyen)

Directors for Europe Eastern: Kaan Dogan, (Attila Dogan Construction & Installation Company Inc.) and Iosif Panchak (Stroygazmontazh)

Directors for Europe Mediterranean: Leonardo Gravina (Sicim) and Bruno Maerten (GEOCEAN)

Directors for Europe North-West: Andy Ball (Land & Marine) and Adam Wynne Hughes (CRC-Evans)

invite new potential members of the Association to participate, and to discuss topics of particular relevance to their area.

In September 2012, IPLOCA collaborated with the Construction Sector Council of Canada (CSC) to produce a safety DVD entitled

▼ Loek Vreenegoor (left) presenting the IPLOCA Environmental Award to Rashid Shuhaiber (centre). Adam Wynne Hughes is on the right.



Director for America North: Scott Summers (ARB, Inc.)

Directors for Latin America: Jesus Garcia Pons (Arendal) and Raul Vilugron (Montec)

Director for Middle East & Africa: Ibrahim Zakhem (Zakhem International Construction)

Directors for East & Far East: Andy Lukas (A.J. Lucas) and Sandip Sharma (Kalpataru)

Directors for Associate Members

Greg Miller (Pipeline Inspection Co. Ltd), Michael Rae (Argus Ltd) and Pierluigi Zanin (Goriziane Group)

Directors-at-Large

Jerrit Coward (Willbros Group, Inc.)

Marco Jannuzzi (Caterpillar)

Wilhelm Maats (Maats Pipeline Equipment)

Karl Trauner (HABAU)

Jean-Claude Van de Wiele (Spiecapag)

More than €13,500 were raised via a lottery for "Send me to school, Dad" (Baba Beni Okula Gönder) an initiative to support continuing education for girls in Turkey. Volvo Construction Equipment and Renault Trucks generously provided a voucher toward the purchase of a car.

A number of guest speakers gave presentations at the Open General Meetings. These included Professor Ilber Ortayli who spoke on Istanbul: History and Population; Bruce Luberski, Vice President for BP's Global Project Organisation, Azerbaijan-Georgia-Turkey Developments: Shah Deniz Development; Suzanne Minter, Energy Analyst/Account Executive, BENTEK Energy: The Impact of Shale Gas Worldwide; Andreas Kohler, Managing Director, ILF Consulting Engineers: Trans-Asia Gas Pipeline from Turkmenistan to China; Bill Hoff, Director Engineering Group, Gulf Interstate Engineering Company and Edward J. Wiegeler, President, Professional Services, Willbros Engineers (US), LLC:

Rebuilding the World's Pipeline Infrastructure;

Angus Paterson,

Managing Director,

Paterson & Cooke:

Requirements for the Design and Commissioning of Long Distance

Slurry Pipeline Systems; Hisham Kawash,

Senior Manager, Sales, Estimation &

Proposals – Pipelines, CCC: Case History:

Constructing a Slurry Pipeline in Madagascar;

and Daslav Brkic, Vice President E&C

Business Development, Saipem: Nord Stream Offshore Pipeline.

Two awards were presented during the Open General Meetings, as follows:

IPLOCA Health & Safety Award, sponsored by Chevron:

The award was presented by Adam Wynne Hughes, Chairman of the IPLOCA HSE Committee to Brad MacLean, Senior Vice President of Enterprise Support and Jerrit Coward, President of the Oil & Gas Segment for Willbros, for their "Investing in Safety: The Willbros Safety Talisman Programme".

Runners-up were Max Streicher for their Pocket Alarm and CCC for their "Innovation in Health and Safety Awareness and Communication" programme.

IPLOCA Environmental Award, sponsored by Shell

The award was presented by Loek Vreenegeer of Shell to Rashid Shuhaiber, Executive Director Pipelines Business Unit, CCC, for their Creativity in Waste Management programme.

The next IPLOCA Convention – the 47th annual – will take place in Washington DC, September 23-27.

H. Douglas Evans, President & CEO of Gulf Interstate Engineering, is the President of IPLOCA (www.iploca.com).



Golden Strategies for a Golden Age of Natural Gas in Transportation

By Alicia Milner

The global natural gas for transportation market is experiencing strong rates of growth because of the fuel cost savings, emissions reductions and energy security benefits of natural gas vehicles (NGVs). A recent report from US-based Pike Research forecasts that the world market for medium- and heavy-duty natural gas trucks will grow by 14% per year to 2019. The projected global rate of growth for natural gas buses was even higher at 19% per year. Similarly strong will be the growth in light-duty natural gas vehicles, exceeding 10% per year with the Asia-Pacific region leading worldwide market growth. These are impressive rates of growth particularly given broader economic trends and the fiscal challenges many countries face as they grapple with rising expenditures and heavy debt commitments.

In addition to the promising outlook for onroad vehicles is the rapidly expanding scope of natural gas use for heavy horsepower applications. Marine classification society Det Norske Veritas (DNV) estimates that 64 vessels will operate on LNG by 2015, nearly double the number of LNG vessels currently in use globally. Heavy equipment manufacturer Caterpillar is working to bring natural gas versions of its marine, rail, mining, earthmoving and drilling products to the market. The availability of commercial engine technologies along with the same suite of benefits enjoyed by on-road NGV users – fuel cost savings, emissions reductions and greater energy security – are driving these changes.

So how do the natural gas, automotive and NGV industries capitalise on this very promising market outlook? Borrowing from the International Energy Agency's recent *Golden Rules for a Golden Age of Gas* report, the three industries may want to consider the following four "golden strategies for a golden age of natural gas in transportation" in order to

maximise market benefits, optimise market penetration and secure a mainstream position for natural gas in the transportation sector:

- ◆ Collaborate and form new partnerships;
- ◆ Advocate and educate;
- ◆ Share and communicate successes more broadly;
- ◆ Systematise safety and safe operating practices.

By applying these "golden strategies", industry can lever decades of NGV technology development and industry experience, capitalise on the expanded supply of global natural gas resources and significantly grow the market for natural gas as a transportation fuel.

Collaborate and form new partnerships

There is a wealth of knowledge within the NGV industry, but the industry has typically been challenged with respect to the financial and human resources needed to grow the market for natural gas as a transportation fuel. One unique collaboration that aims to surpass these limitations is the Drive Natural Gas Initiative. This partnership of more than 50 US natural gas producers and natural gas utilities linked to the American Gas Association and America's Natural Gas Alliance seeks to expand the role of natural gas in the transportation sector through activities that include active outreach to light-duty vehicle manufacturers and cooperation with NGV Global member, NGV America.

Advocate and educate

NGVs have a lengthy and proud history, but policymakers and other important audiences and influencers don't always have a current view of the capabilities and benefits of natural gas in transportation. Europe's Blue Corridor project has been in place in various forms over more than a decade with an emphasis on educating and demonstrating the environmental and economic viability of the movement of people and goods using NGVs. The NGV sectors in Europe and Russia have been



important contributors to the Blue Corridor project. Most recently, the European Business Congress, a non-governmental organisation made up of representatives from 23 Organisation for Security and Cooperation in Europe (OSCE) states, approved an expanded Blue Corridor project which will allow for continued advocacy, education and awareness building in support of greater natural gas use in transportation.

Share and communicate successes more broadly

With many diverse markets around the world for NGVs and a range of factors that have contributed to local market success, it is critical that industry successes be shared and examined for potential application in new markets. NGV Global and its members actively liaise with and participate in IGU's Working Committee 5, whose Study Group 5.3 is focused on NGVs as a gas utilisation opportunity. Given that IGU promotes the progress of the natural gas industry and transportation represents a major market opportunity since as much as a third of domestic energy use in many countries goes to power vehicles, there is a clear area of mutual

interest and potential mutual gain as both organisations work to examine and share natural gas for transportation success stories around the globe.

Systematise safety and safe operating practices

NGVs have a proven track record of safe operation and, as market growth continues, it will be important to "systematise" industry best practices and safe operating procedures so that this safety record is maintained. This recommended golden rule applies, of course, to both compressed natural gas (CNG) and LNG vehicles and stations. NGV Global uses its global reach to communicate the importance of safe practices including documenting key technical issues such as CNG cylinder and vehicle verification at the point of refuelling, the subject of a recent technical position paper from the international association. As the natural gas for transportation market continues to grow and the range of applications increases, it will be critical that stakeholders from the natural gas, automotive and NGV industries cooperate and jointly resource activities to ensure that safety and continuous improvement are consistently addressed as ongoing priorities.

The window is "wide open" for a significant increase in NGV use. The degree to which natural gas is successful in becoming a mainstream transportation fuel across a spectrum of opportunities including onroad, marine, rail and offroad vehicles will be contingent on the natural gas, automotive and NGV industries finding new ways to collaborate and to apply the "golden strategies". All three industries stand to gain as market benefits are maximised, market penetration is optimised and natural gas builds from its current strengths to solidify its role as a mainstream transportation fuel.

Alicia Milner, President of the Canadian NGV Alliance, is NGV Global Chairperson (www.ngvglobal.com).

◀ Alicia Milner (then Deputy Chair of NGV Global) and Gabriele Gozzi (then Chair) open the NGV Global 2012 exhibition which was held in Mexico City in November 2012.

Saudi Aramco – The Reliable Provider of Energy to the World

The story of Saudi Aramco tells of the discovery and development of the greatest energy reserves the world has ever known and the rapid transformation of the Kingdom of Saudi Arabia from desert kingdom to modern nation-state. Saudi Aramco has grown from an oil-producing company to a fully integrated, global energy enterprise with partnerships in North America, Europe and Asia and over the course of its 80-year history, Saudi Aramco has built an unmatched record of reliability, and remains committed to providing energy to the world. The company is further embarking on a strategic transformation to become a world-leading energy and chemicals enterprise, and be a catalyst for Saudi Arabia's economic growth and diversification.

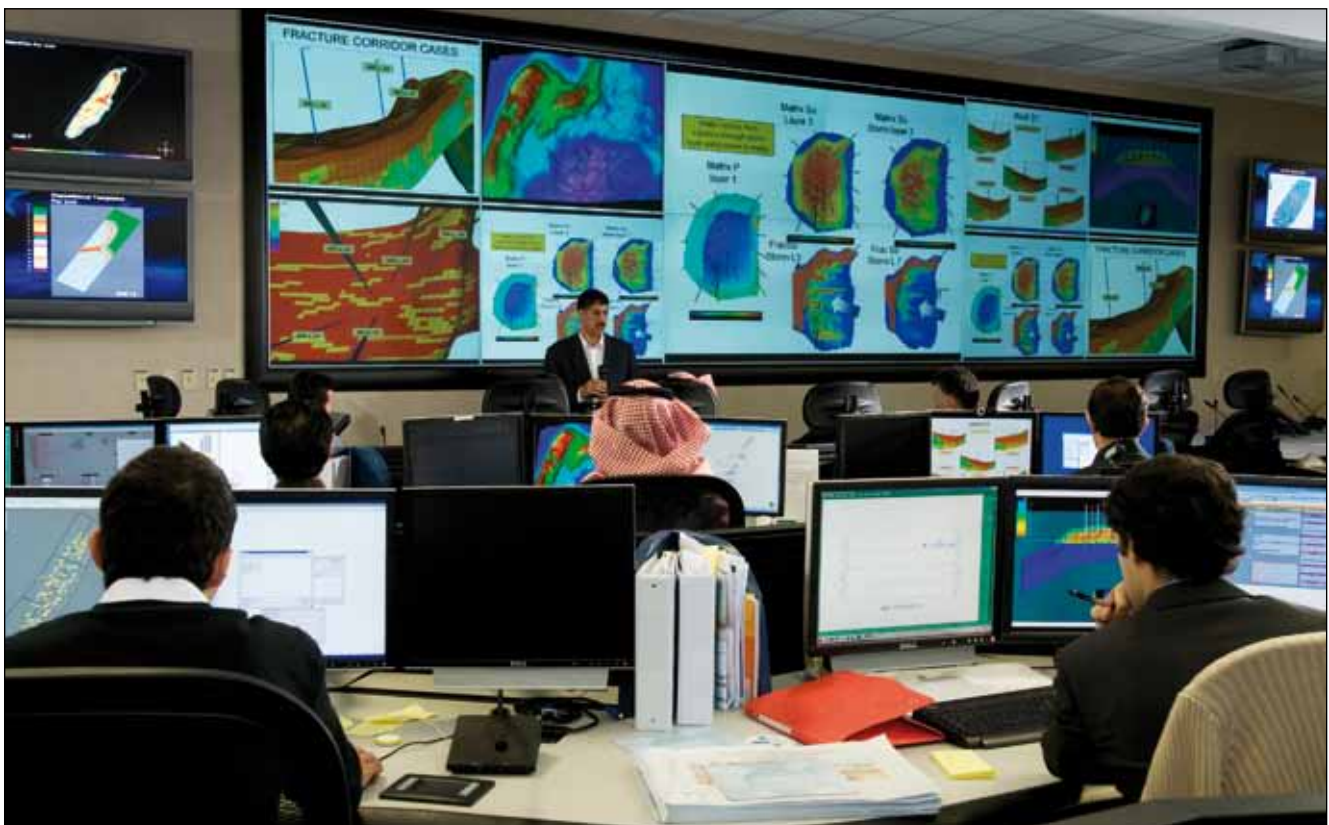
Nearly one in every seven barrels of oil produced around the world comes from Saudi Aramco, and the company has a sizeable spare production capacity, playing a critical role in global energy markets.

Saudi Aramco's Gas Operations is responsible for supplying gas to the Kingdom's major utilities and industries. During the early years of oil processing, associated gas was flared. In the early 1970s, the Kingdom discovered the virtues of gas as a valuable hydrocarbon resource and directed Saudi Aramco to plan and implement the Master Gas System (MGS), the largest industrial project in the world at that time. The task was an enormous undertaking, involving tens of thousands of workers, both on the ground in the Kingdom and in offices and fabrication facilities in several continents. The MGS enables Saudi Aramco to use nearly all the associated gas produced with oil production and non-associated gas produced from deep natural reservoirs. This achievement adds the equivalent of more than a million barrels of oil a day to global energy supply.

Over the last 30 years, annual demand for sales gas delivered by the MGS has

grown rapidly in both the petrochemical and power generation sectors. Demand for gas is expected to continue to grow as the country's domestic and industrial bases expand. Saudi Aramco's MGS includes massive gas plants that currently handle a total gas production of more than 10 billion standard cubic feet (SCF) of gas every day. Continued expansion of the MGS is planned with multi-billion dollar projects under way, enabling an increase in gas processing capacity.

In 2011, Saudi Aramco's natural gas reserves stood at 283 trillion cubic feet and its quest for more conventional and unconventional gas discovery and production continues. Continued gas exploration and its commercialisation is expected to deliver major benefits to the Kingdom in terms of creating jobs, further spurring petrochemical development, and benefiting electric power generation utilities through utilisation of cleaner, more efficient natural gas.



Saudi Aramco's Event Solution Centre focuses the collective skills of multi-disciplinary teams to solve reservoir production issues. Their work has significantly reduced completion time for studies, compressed major decision cycles and reduced uncertainty.

Powering Possibilities

أرامكو السعودية
Saudi Aramco



Energy to the World

In the 1970s, Saudi Arabia recognized the merits of gas as a valuable clean energy resource. This led the country to take an economic and environmental step forward with the creation of the Master Gas System (MGS). Today the MGS, constructed and managed by Saudi Aramco, includes massive gas plants that can handle daily gas production capacity of more than 12 billion standard cubic feet (SCF). As the backbone of the country's industrial network, plans are in place that will increase daily capacity to more than 15 billion SCF.



As Saudi Aramco expands its gas exploration and production activities, we are always looking for talented professionals. For more information on career opportunities with Saudi Aramco, visit

www.jobsataramco.com

Imagine Gas Innovation

By Daniel Hec

Innovation and technology are essential for the future of natural gas and the second European Gas Technology Conference (EGATEC 2013) provides an excellent forum to discuss the latest developments. Under the slogan “Imagine Gas Innovation”, it will take place in Paris, France, May 30-31 at the centrally-located Salons Hoche.

EGATEC 2013 is organised under the joint auspices of Marcogaz – Technical Association of the European Natural Gas Industry and GERG – European Gas Research Group, and is hosted by GDF SUEZ – Research and Innovation Division and the French Gas Association (AFG). It builds on the success of EGATEC 2011, which gath-

ered more than 250 participants from the gas world: gas technology managers, gas engineers and researchers as well as market professionals.

The Chairman of the National Organising Committee (NOC) for EGATEC 2013 is Marc Florette, Director of Research and Innovation at GDF SUEZ, who is also the President of Marcogaz; the Chairman of the Programme Committee is Bernard Blez, Vice President of CRIGEN, the research centre of the GDF SUEZ Group, which is dedicated to gas and new energies.

For this second edition, the conference focuses on how gas is one of the best compe-

► EGATEC 2013 builds on the success of EGATEC 2011, which was held in Copenhagen, Denmark. IGU's then President, Datuk Abdul Rahim Hashim (left with conference host Peter Hinstrup) was a keynote speaker.





titive options in an innovating energy world. Natural gas is set to increase its position as a major fuel in European energy supply and will play an important role in the transition to a future, less carbon-intensive energy system.

Some of the selected topics are:

- ◆ The role of gas in a low-carbon energy mix;
- ◆ Smart metering and demand management;
- ◆ Energy market and energy systems;
- ◆ Energy efficiency and gas utilisation;
- ◆ Safe operation of infrastructure;
- ◆ Mobility including LNG as fuel;
- ◆ Bio-methane and green gas;
- ◆ Power-to-gas; and
- ◆ Gas quality.

Keynote speakers including IGU's President, Jérôme Ferrier who will open the conference, will give some insights on future trends in a fast-changing economic and geopolitical environment where energy sources, and especially gas, play a crucial role. Technical presentations will be given by international experts and there will be a roundtable on "Natural Gas in the Renewable Energy World". On top of this there will be a poster exhibition with some 20 R&D papers from the GERG Academic Network. The conference also features an innovation exhibition.

Additionally, some technical visits will take place on May 29 offering delegates the opportunity to discover innovative and energy efficient services and solutions, in various

types of buildings and for different uses. Sites should include CRIGEN, the headquarters of gas distributor GrDF and a cogeneration plant which serves a district heating system.

For more information on EGATEC 2013 and to register, visit www.egatec2013.com.

Daniel Hec is the Secretary General of Marcogaz (www.marcogaz.org).



◀ Marc Florette (pictured at EGATEC 2011) is the Chairman of the NOC for EGATEC 2013.

Be Inspired in Copenhagen

By Peter Hinstrup

The next IGU Research Conference – IGRC2014 – will be held in Copenhagen, Denmark, September 17-19, 2014 with the theme: Gas Innovations Inspiring Clean Energy.

IGRC is the premier global forum devoted to presentation and discussion of gas research, and attracts gas company executives, researchers and others from all over the world. It has been held since 1980, normally once every three years. IGRC2014 in Copenhagen is the 14th in this series of conferences.

IGRC2011 in Seoul attracted more than 500 participants and IGRC2008 in Paris attracted more than 800 participants. In Copenhagen a total conference attendance of 750-1,000 from Europe and overseas is expected.

IGRC2014 will act as a technology forerunner for the 26th World Gas Conference, which will take place in Paris, June 1-5, 2015.

Organised by passionate IGU members

The conference is organised by the Danish Gas Technology Centre (DGC) acting on behalf of the Danish Gas Association, the IGU Charter Member from Denmark.

The conference technical programme is being developed by IGU's Programme Committee F for Research, Development and Innovation under the chairmanship of Dr Jack Lewnard of the Gas Technology Institute, USA.

A corps of more than 60 IGRC2014 ambassadors from all over the world acting on a voluntary basis will assist in the planning and marketing of the conference.

A different type of venue

IGRC2014 will be held in the state-of-the-art Tivoli Congress Center (TCC). Opened in 2010, TCC is located in the heart of Copenhagen within walking distance of the Tivoli Gardens, the Town Hall Square, the pedestrian shopping



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streets and the waterfront. TCC was designed by the world-famous architect Kim Utzon.

Conference programme and exhibition

The programme will feature oral presentations, roundtables and poster sessions. The focus will be on all important aspects of the role of natural gas, other energy gases and the gas infrastructure in a future low-carbon energy system. IGRC2014 will also feature an exhibition of advanced gas technology equipment and services from gas companies and manufacturers around the world.

We look forward to your input

Conference papers will be selected on the basis of abstracts. A Call for Papers will be issued on November 1, 2013. Registration will also open on November 1. Make sure you receive our announcements and newsletters by signing up at www.igrc2014.com.

The IGRC2014 organising team will be present at the IGU booth at the LNG 17 exhibition in Houston, April 16-19. Please come and visit us and receive more information.



Strong sponsor support

We are extremely pleased with the strong sponsor support already in place and thank our sponsors for their invaluable contributions.

Peter I. Hinstrup, President of DGC and Honorary Member of IGU, is the IGRC2014 Conference Director.



◀ IGRC2014 will be held in Copenhagen (LEFT) at the Tivoli Congress Center (ABOVE).

GTT, a leading engineering company in the field of LNG

With more than 70% of the world LNG carrier fleet equipped with GTT membrane technologies, and with 50 years of experience, GTT is a world leader in the design of membrane containment systems for the maritime transportation and storage of LNG. The GTT systems have become the technology of choice for new LNG carrier orders and GTT's market share is constantly increasing.

Its expertise and ability to innovate to meet customer requirements and international regulations allows GTT to propose solutions for the whole LNG chain: use of LNG as a fuel for sea-going vessels, distribution by feeder or barge, land/sea storage, offshore platforms etc.

As a recognised leader in the market, GTT is the ideal partner for all LNG projects.

The prospects for LNG are very favourable considering the current rate of consumption. Today, there are nearly three centuries of gas reserves in the world. In addition, it is the cleanest fossil fuel and is therefore growth is set to continue. Philippe



Philippe Berterroitière, Chairman and CEO of GTT.

Berterroitière, GTT Chairman and CEO, adds that the current difficulties faced by the nuclear industry will help to expand the share of gas in the energy mix.

"GTT teams are making every effort to bring the best to our partners along the LNG chain; this workforce is dedicated to research and innovation, and is the main part of our success", said Mr Berterroitière.

What are the main advantages of the GTT technology compared to competitive technologies?

- Within the same vessel hull, GTT technologies permit the storage of more LNG;
- Construction of a GTT tank, requiring less expensive components, is more economical than other technologies;
- The insulation spaces are continuously monitored, so any leakage is detected quickly. This is a very important safety factor.



Inside a GTT membrane tank.

Arctic Revolution

Ob River, an LNG carrier equipped with GTT membrane tanks, has become the first ship of its kind to sail across the Arctic during winter.

The *Ob River's* odyssey lasted 27 days, over a distance of more than 6,000 miles through Russia's Northern Sea Route (NSR) from Norway to Japan. The increased use of the NSR could open up new transport and trade opportunities that may revolutionise shipping: using the Arctic route can cut journey times by 40% compared with the Suez Canal. Built in 2007 by Hyundai Heavy Industries, *Ob River* is one of a few ice-class LNG carriers. It is equipped with four Mark III membrane tanks, and chartered from Dynagas by Gazprom. *Ob River* is, in part, a recognition of the work GTT has carried out to



The *Ob River* making its pioneering voyage through the Northern Sea Route.

demonstrate that GTT technologies are fit for use in Arctic conditions. "We are very proud that the first LNG carrier to have sailed through the Northern Sea Route is a membrane ship. It is also recognition of all that we have done to demonstrate that

GTT technologies are fit for Arctic conditions", said Mr Berterroitière.

The International Gas Union has selected Paris, France, as the venue for the World Gas Conference in 2015. GTT will be there! Come and visit us on our booth.



GTT: Solution provider for LNG



GTT, with 50 years of experience in the design of membrane containment systems for liquefied gas, is your Partner for all your LNG projects. More than two thirds of the LNG carrier fleet are equipped with GTT membrane technologies. GTT is concentrating on developments for the future use of LNG as a fuel for sea-going vessels.

As a world leader in LNG containment systems, GTT is ideally placed as a solution provider for the whole LNG chain (land/sea storage, distribution by feeder or barge, bunker tanks, offshore platforms, etc.).

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Countdown to the 26th World Gas Conference

By Daniel Paccoud

The triennial World Gas Conference is the premier event in the gas calendar. This is the first of what will be a regular series of updates on preparations for WGC 2015 from the Chair of the National Organising Committee (NOC).

More than 4,000 delegates from 80 countries are expected at the 26th World Gas Conference, which will be held in Paris, June 1-5, 2015. The venue will be the Porte de Versailles Convention Centre which includes one of the biggest arenas in Paris, the Palais des Sports.

WGC 2015 will be the culmination of the French Presidency of IGU, offering an unparalleled forum for the gas community to meet and debate the issues facing the industry as it works to expand the role of abundant, available and environmentally acceptable natural gas in the global energy mix.

During the conference, the work of IGU's 11 Technical Committees and three Task Forces will be presented in committee sessions and strategic



▶ Daniel Paccoud,
NOC Chair.

▶▶ Annie Louys,
NOC Secretary.

panels; while plenary sessions will feature leading figures in the gas industry and policymakers. The exhibition will allow companies active throughout the gas chain to showcase their products and services to an expected 20,000 visitors. There will also be a special programme designed to engage with young people and recruit the next generation to the gas industry.

The Opening Ceremony and plenary sessions will be held in the Palais des Sports, which has a capacity of 4,000 people, with the other





◀ The venue for WGC 2015 will be the Porte de Versailles Convention Centre.

conference sessions in Hall 2 of the Convention Centre and the exhibition in Hall 1.

More than 4,000 rooms have been reserved in a range of hotels and shuttle services will be provided between the main hotel areas and the Convention Centre. There are also convenient public transport links by metro, tram and bus.

The Call for Papers will be launched on February 1, 2014 with a deadline for abstract submission of September 1, 2014. Conference registration and accommodation booking will open on April 1, 2014, and the conference programme will be launched on June 1, 2014. The NOC has appointed the Elephant Group





▲ The Palais des Sports is one of the biggest arenas in Paris

as conference organiser and the CWC Group to handle marketing and communications.

Exhibition and sponsorship

The entire exhibition will be accommodated in Hall 1 through which delegates will pass to reach the conference and luncheon sessions. The hall offers 20,000m² and over a third of the space has already been sold to companies taking advantage of a reduced price for bookings made before June 2014.

There are many sponsorship opportunities and we are pleased to announce that Total and GDF SUEZ are the Host Sponsors for the Opening Ceremony and Welcome Gala Dinner.

The NOC has appointed Exhibitions and Trade Fairs (ETF) to manage the exhibition and sponsorship arrangements.

Social programme and technical visits

The WGC golf tournament will be held on May 31, while city tours of Paris will be offered throughout the week. There will also be excursions to Versailles, a cruise on the River Seine and a visit to Montmartre.

The technical visits will take place on June 6. Details are being finalised but sites under consideration include the Fos Tonkin LNG receiving terminal in southern France, the DK6 CCGT power plant in Dunkirk on the northern

coast, the aerospace complex in Toulouse and a transport hub near Paris.

Welcome to Paris

We are preparing an exciting and stimulating programme for WGC 2015. Your first port of call for information and the latest news is our website, www.wgc2015.org, but please do not hesitate to contact the NOC if you have any questions. The whole French team looks forward to welcoming you to Paris.

Daniel Paccoud is the Chair of the National Organising Committee for WGC 2015.

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The French Gas Association

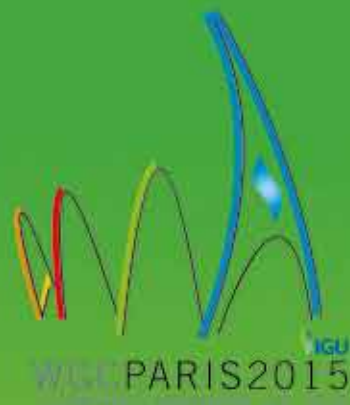
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www.afgaz.fr



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- Promotion of the gas industry in France at national, European and international levels
- Supplier of services in the fields of standardisation and certification
- Exchange of information and expertise between gas players
- Develop and provide training courses with our Gas Techniques Training Centre, CFAFG



AFG supports
the National Organisation
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Conference Paris 2015

www.wgc2015.org

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Introduction and Key Developments

By Georges Liens



▲ Georges Liens: we have to build on the work carried out during previous triennia.



▲ Yves Tournié is the Secretary of the Coordination Committee.

The Triennial Work Programme proposed by the French Presidency was formally endorsed by the Executive Committee in Ottawa, Canada in October 2012. All the Working Committees, Programme Committees and Task Forces started work before the end of November.

The theme for the 2012-2015 Triennium “Growing together towards a friendly planet” is based on three main ideas:

- ◆ Natural gas is a “foundation” fuel, a core pillar for sustainable development owing to its intrinsic qualities as a clean, affordable, reliable, efficient and secure fuel;
- ◆ Our energy must be available everywhere – especially in developing countries and particularly in Africa – and its role will grow in Asia and in South America;
- ◆ Continuity is essential for IGU if we want the voice of gas to be fully recognised and we have to build on the work carried out during previous triennia.

In order to develop our theme, the industry will have to:

- ◆ Advocate for the choice of natural gas as a foundation fuel for a sustainable development everywhere including mature markets;
- ◆ Promote an efficient and constructive combination with renewable energies and the electricity sector, based on their complementarities;
- ◆ Improve the availability of our energy in new areas and in developing countries;
- ◆ Attract and retain new young human resources for the future.

This vision is illustrated by the four pillars of an “Eiffel Tower” we will try to build together for this triennium:

- ◆ The green pillar “Natural gas for a sustainable development”;

- ◆ The yellow pillar “Combination with renewables and electricity”;
- ◆ The red pillar “Natural gas available everywhere”;
- ◆ The purple pillar “Human resources for the future”.

The structure of the working groups is similar to the previous triennium. There are five Working Committees for the different stages in the gas chain, six Programme Committees looking at issues transversal to the gas chain and three Task Forces looking at human capital, gas advocacy and geopolitics (see *Table 1*). The main change is the creation of a new committee – PGC F – which is responsible for the technical programme of the IGU Research Conference (the next IGRC will be held in October 2014 in Copenhagen) and is also studying natural gas R&D.

All working groups will collaborate on the four transversal themes (pillars) throughout the triennium with PGC A having overall responsibility for sustainable development (green), PGC F for combination (yellow), PGC C for availability (red) and TF 1 for human resources (blue). In order to stimulate dialogue and maximise the contribution of members who cannot attend all the meetings, the French Presidency has built a collaboration platform (see *box on page 98*). This extranet is open to all members of the groups and allows them to exchange ideas and documents on their specific issues and also on the four pillars.

The series of kick-off meetings (excepting TF 3) started in September 2012 in Doha, Qatar, where the new TF 1 convened, and ended in November 2012 with a joint meeting of PGC B and PGC C in Oran, Algeria. Joint meetings (WOC 1 and PGC A also held one) are an excel-

Leadership of IGU Committees and Task Forces 2012-2015

Committee	Chair	Vice Chair
WOC 1 Exploration & Production	Denis Krambeck Dinelli, Brazil	Adif Zulkifli, Malaysia
WOC 2 Storage	Ladislav Goryl, Slovak Republic	Nikita Barsuk, Russia
WOC 3 Transmission	Benjamin Guzman, Argentina	Jaroslav Petros, Czech Republic
WOC 4 Distribution	Dietmar Spohn, Germany	José Maria Almacellas, Spain
WOC 5 Utilisation	Eugene Pronin, Russia	Bijan Ochani, Iran
PGC A Sustainability	Satoshi Yoshida, Japan	Mauro Soares, Argentina
PGC B Strategy	Fethi Arabi, Algeria	Ulco Vermeulen, The Netherlands
PGC C Gas Markets	Gi Chul Jung, Korea	Sid-Ahmed Hamdani, Algeria
PGC D LNG	Dirk van Slooten, The Netherlands	Masanori Oki, Japan
PGC E Marketing & Communication	Alfredo Ingelmo Torres, Spain	Barbara Jinks, Australia
PGC F R&D & Innovation	Jack Lewnard, USA	Gerald Linke, Germany
TF 1 Human Capital	Agnès Grimont, France	Abdulaziz Mohammed Al-Mannai, Qatar
TF 2 Gas Advocacy	Michele Pizzolato, Italy	Kevin Murphy, USA
TF 3 Geopolitics	Geert Greving, The Netherlands	Chang Keun Lee, Korea

lent way of addressing the transversal themes of the French Presidency. TF 3 did not hold a formal meeting until February although it did organise a workshop in Ottawa. The leadership worked first to secure the participation of two renowned Dutch and French research institutes, the Clingendael International Energy Programme

(CIEP) and Institut Français des Relations Internationales (IFRI), and some sponsors.

At press time, the working groups had 929 members from 56 countries (see Table 2 over), a very good result eight months after the first nominations, and representation from some important countries is still to be completed.

▲ Table 1.



◀ The strategic framework for the 2012-2015 Triennium is based on four pillars.

Members of the IGU Committees and Task Forces, Top 10 Countries of Origin (as of February 2013)

WOC 1 Exploration and Production	64	Russia	117
WOC 2 Storage	76	France	79
WOC 3 Transmission	106	Iran	47
WOC 4 Distribution	96	The Netherlands	38
WOC 5 Utilisation	73	Korea	36
PGC A Sustainability	61	Spain	35
PGC B Strategy	90	Algeria	33
PGC C Gas Markets	56	Poland	33
PGC D LNG	102	Japan	29
PGC E Marketing and Communication	45	Germany	26
PGC F R&D and Innovation	49		
TF 1 Human Capital	44		
TF 2 Gas Advocacy	34		
TF 3 Geopolitics	33		
Total	929		

The average attendance at the kick-off meetings was around 30 members per group. There have been some amendments to the individual study groups since the last issue of the IGU magazine and *Table 3* gives the current state of play.

The Coordination Committee (CC) composed of the leadership of the 14 groups has decided to organise a workshop dedicated to one pillar at each of its bi-annual meetings. The first of these was held on combination with renewables and electricity (yellow pillar) in Ottawa in October 2012, and the second will be held on human resources (purple pillar) during the CC meeting in Seville, Spain in April.

Georges Liens is the Chair of the Coordination Committee.

▲ Table 2.

▶ Table 3.

Study Group Summary for the 2012-2015 Triennium

Committee	Study Group	Topic
WOC 1	SG 1.1	Technological advances in gas exploration and production
WOC 1	SG 1.2	Assessment of global gas reserves and resources
WOC 1	SG 1.3	Gas rent and mineral property rights
WOC 2	SG 2.1	Underground gas storage database
WOC 2	SG 2.2	Techniques and new opportunities
WOC 2	SG 2.3	Human resources: Attracting students to storage activities
WOC 3	SG 3.1	New transportation projects
WOC 3	SG 3.2	Integrity management systems
WOC 3	SG 3.3	Public acceptance and new technologies
WOC 4	SG 4.1	Regulation of third-party access to gas distribution networks: A standard approach
WOC 4	SG 4.2	Diversification of gas quality and non-conventional sources in a carbon-free future
WOC 4	SG 4.3	Smart grids in gas distribution: Scope and purpose
WOC 5	SG 5.1	Industrial utilisation
WOC 5	SG 5.2	Domestic and commercial utilisation
WOC 5	SG 5.3	Natural gas vehicles (NGVs)
WOC 5	Topic Team 5.1	Renewable energy, CO ₂ emissions, hydrogen
WOC 5	Topic Team 5.2	Gas quality
PGC A	SG A.1	Carbon capture and storage
PGC A	SG A.2	Natural gas and renewable gas
PGC A	SG A.3	Life-cycle analysis of the natural gas chain
PGC A	SG A.4	Environmental aspects of unconventional gas



◀ The Coordination Committee brings together the leadership of the 14 working groups.

<i>Committee</i>	<i>Study Group</i>	<i>Topic</i>
PGC B	SG B.1	World gas supplies, demand and trade
PGC B	SG B.2	Wholesale gas price formation study
PGC B	SG B.3	Strategy and regulation
PGC C	SG C.1	The role of natural gas in the electricity generation mix
PGC C	SG C.2	Implications of developing unconventional gas
PGC D	SG D.1	Remote LNG
PGC D	SG D.2	LNG as fuel
PGC D	SG D.3	Small-scale LNG
PGC D	SG D.4	LNG life-cycle analysis
PGC D	SG D.5	Annual World LNG Report
PGC E	SG E.1	Marketing natural gas and promoting new usages
PGC E	SG E.2	Competing and coordinating with other energies
PGC E	SG E.3	Communication and public acceptance of natural gas projects
PGC F	SG F.1	Technical Programme Committee for the IGU Research Conference (IGRC 2014)
PGC F	SG F.2	Development of international gas RD&I collaborative programmes
PGC F	SG F.3	Gas convergence with electricity and renewables
TF 1	TF 1.1	Youth event in Paris
TF 1	TF 1.2	Perception and increasing influx of youth in STEM
TF 1	TF 1.3	Increase of female presence in the industry
TF 2	Special Project	Gas advocacy
TF 3	Special Project	Geopolitics

Join Us on the Growing Together Platform

By Micaela Garcia

The Growing Together collaboration platform was launched in September 2012, and as webmaster I am proud to present it.

The French Coordination Committee initiated this new Information and Communication Technology tool in order to stimulate exchanges between work groups. It is a private collaboration platform, accessible only by members, designed to promote teamwork and discussion, and interaction between the various committees and groups. It allows members – especially those unable to attend meetings – to remain fully informed of developments and discussion points, through reports and interactive content posted on the site. It is an ideal tool for launching debates between members or requesting information as it is equipped with powerful search tools.

The Growing Together collaboration platform is mainly used for working group exchanges:



- ◆ Before meetings: to issue practical information concerning the forthcoming event;
- ◆ After meetings: to provide copies of the presentations made during the meeting so that all delegates (even those who were absent) can download them;
- ◆ Between meetings: to launch and follow ideas, debates, etc.

User's testimonials – "What do you think about the Growing Together website?"

"Growing Together is a good website and a very useful tool. I expect many members of PGC D to use it and to be actively part of the exchange of information."

Feikje Wittermans, Secretary of PGC D – LNG

"It's a great website and a nice collaborative platform for PGC F, which we are going to use to communicate our activities, report on work progress and share ideas."

Rod Rinholm, Secretary of PGC F – R&D & Innovation

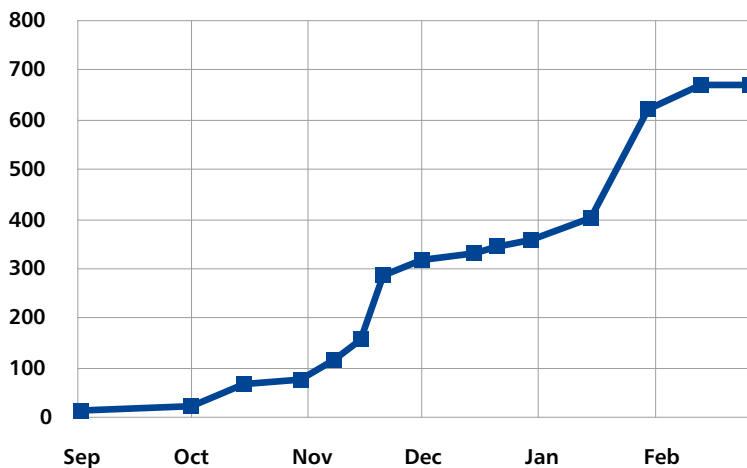
"It's a wonderful tool to exchange ideas and foster a better understanding of the gas industry."

Sonia Lefebvre, Secretary of TF 1 – Human Resources

Contact

Access to Growing Together is by invitation only. If you want to invite new members please contact: mgarcia@wgc2015.org.

Growing Together Website Registrations from September 2012





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Progress Reports from the Committees

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

Working Committee 1 – Exploration and Production

WOC 1 is chaired by Denis Krambeck Dinelli (Petrobras, Brazil) and has 64 members from 24 countries, which is a record participation for this IGU committee. This is probably due to the substantial conventional and unconventional reserves that can be readily developed today in several regions of the globe, whose economic feasibility nevertheless still face important challenges from the technical and environmental standpoints.

The industry will have to adapt itself to new standards of product quality, safety requirements and environmental restrictions, for example, with much tougher controls for CO₂ emissions and disposal of residues. In addition, higher production costs can be expected as the

new areas are much more difficult to develop than the previous ones.

As a consequence, WOC 1 has decided to focus on (1) technological advances for the exploration and production of natural gas, (2) assessment of conventional and unconventional reserves and resources, and (3) analysis of policies for mineral property rights and gas rent, and has set up three study groups accordingly.

SG 1.1 *Technological advances in gas exploration and production*

This study group will investigate the most recent technological advances in the exploration and production of natural gas under the leadership of Adif Zulkifli (Petronas, Malaysia), who is WOC 1's Vice Chair. It will aim for a consolidation of best practices for both conventional and unconventional gas, highlighting new technologies that have recently emerged via R&D. The technologies will

▼ Delegates to the joint WOC 1/PGC A meeting in Sapporo pose for a group photograph. Denis Krambeck Dinelli, Chair of WOC 1 and Satoshi Yoshida, Chair of PGC A are fifth and sixth in the front row.



be presented according to the conventional life cycle of E&P projects, i.e., exploration, appraisal, development and production.

Topics of interest for this group include:

- ◆ Advances in seismic and imaging technology;
- ◆ Drilling technologies;
- ◆ Well surveys;
- ◆ Processing and management of gas with high CO₂ content, H₂S and helium;
- ◆ Multi-stage and other fracturing technologies;
- ◆ New technologies for the development of stranded gas;
- ◆ FLNG and FGTL;
- ◆ Subsea systems;
- ◆ Smart completions;
- ◆ Water control and shutoffs;
- ◆ Processing improvements, retrofits and revamps;
- ◆ Extraction technologies; and
- ◆ Enhancement of brownfield productivity.

SG 1.2 Assessment of global gas reserves and resources

Under the leadership of Dr Mohamed Kaced (Sonatrach, Algeria), SG 2.2 will perform an assessment of conventional and unconventional gas reserves and resources; and will identify new opportunities and threats to be faced by the upstream segment of the gas industry.

In the middle of the so-called unconventional gas revolution, one of the most important challenges to be faced by the industry is the development of reliable estimates for both conventional and unconventional reserves and resources. While performing this task, SG 2.2 will identify the most important projects under development and their potential impact on the availability of natural gas from both regional and global standpoints.

Exploratory hotspots and new frontiers will be highlighted, and the most important trends, opportunities, uncertainties and threats to be faced by the upstream segment of the gas industry will be listed and dealt with.

The group will also examine a number of initiatives for the reduction of associated gas flares as a means to enhance the supply of natural gas.

Deliverables include the assessment of:

- ◆ Remaining reserves and resources of conventional gas;
- ◆ Reserves and resources of shale gas, tight gas, coal-bed methane and methane hydrates;
- ◆ Initiatives for gas flaring reduction and enhancement of gas supply;
- ◆ Exploratory and discovery trends; and
- ◆ New frontiers and exploratory areas for natural gas.

SG 1.3 Gas rent and mineral property rights

WOC 1's Secretary, Dr Marcos Sugaya (Petrobras, Brazil) leads this group, which will compare the business models adopted by different countries to maximise their gas rent.

The exploration, development and production of gas reserves seem to require a differentiated treatment from fiscal policymakers, which must ensure a proper balance of risks and rewards to promote the development of their projects. Conditions may vary dramatically from associated to non-associated gas, or if an NOC is included or not in the game.

▼ Social events during the joint WOC 1/PGC A meeting included a visit to a traditional Japanese restaurant.



A large arsenal of fiscal instruments is available, but usually a mixture of them is used, including signature bonuses, royalties and taxes on profits of varied nature, such as the resource rent taxes of Australia. Even the obligation of acquiring goods and services in the local market can be considered.

SG 1.3 will compare the solutions adopted by a number of countries, and the results obtained by them, aiming at the development of win-win models for both governments and companies. Topics of interest include:

- ◆ Identification of regulatory tendencies;
- ◆ Assessment of business models for exploration and production of gas;
- ◆ Critical analyses of fiscal instruments; and
- ◆ Development of upstream policies for gas rent.

Meetings

The first meeting of WOC 1 was a joint one with PGC A (Sustainability) to discuss the interfaces between the two committees and how they will work together. It took place on September 25-28, 2012, at the Renaissance Hotel in Sapporo, Japan, and was attended by 47 delegates from both committees as well as representatives from WOC 3, TF 2 and the Coordination Committee.

The terms of reference of the study groups were consolidated and a detailed programme of activities for the triennium is available from www.igu.org with presentations, minutes of the meeting and other documents.

The second meeting of WOC 1 was also a joint meeting with PGC A and took place in Rio de Janeiro, Brazil, February 18-21. It will be covered in the next progress report.

Working Committee 2 – Storage

WOC 2 is chaired by Ladislav Goryl (Nafta, Slovakia) and has 70 members. It has three study groups.

SG 2.1 UGS database

Since 2000, the world gas storage database has been regularly developed. Today, it contains unique sets of storage data and technical parameters as well as new projects. The objective of this triennium is to update the database and use it as the basis for defining general and technical trends in storage and predicting future developments. Other deliverables include the possibility of visualising geo-referenced storage facilities and their parameters. SG 2.1 will also highlight the unique role of storage in the gas chain by assessing its interaction with other sources of flexibility.

▼ WOC 2 held its kick-off meeting in Bratislava in October 2012.



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▲ The programme of WOC 2's first meeting included a technical visit to the Gajary Baden UGS facility.

To avoid duplication, SG 2.1 will cooperate on data collection with WOC 1, WOC 3, PGC B, PGC D, UNECE, Gas Storage Europe and the American Gas Association. A study group leader will be appointed in May and data collection will start later in 2013.

SG 2.2 Techniques and new opportunities

Under the leadership of Fabien Favret (EDF, France), James Bradley (BP, UK) and Jacques Grappe (Geostock, France), the objective of SG 2.2 is to improve performance and efficiency of storage facilities by promoting and sharing techniques within the storage community. A special focus will be put on new developments in a variety of fields including techniques to enhance efficiency and reduce environmental footprints. The regulatory frameworks for UGS around the world will be compared and the impact of regulation on projects studied.

SG 2.2's work on energy storage relates to the transversal theme of the combination with renewables and electricity (the yellow pillar) and it will cooperate with PGC F; its work on reducing the environmental footprint relates to sustainable development (the green pillar) and it will cooperate with PGC A.

New planned storage opportunities will also be defined, which would further support the integration of natural gas with renewables and sustainable development. The contribution of

storage facilities will be further expanded. One issue that could be addressed is quality standards for the gas injected into storage facilities. Since natural gas can be stored, unlike other energy sources, there could be a new role for storage in addition to the tradition one of balancing or securing supplies.

SG 2.3 Human resources: Attracting students to storage activities

Under the leadership of Nikita Barsuk (Gazprom, Russia) who is WOC 2's Vice Chair, SG 2.3 will continue the work started in the previous triennium. The aim is to promote the gas storage sector to engineering students and develop specific skills in specialist fields such as reservoir and process engineering. Statistical information will be gathered from IGU members via a questionnaire to understand the demographics of the sector, promotional and educational multimedia tools will be developed, and a competition will be run with the authors of the best theses being invited to WGC 2015.

Human resources (the blue pillar) is a transversal theme and SG 2.3 will cooperate with TF 1.

Meetings

WOC 2 held its kick-off meeting in Bratislava, Slovakia, October 23-26, 2012, which was attended by 54 members. The next meeting will be held in St Petersburg, Russia, May 28-31.



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Working Committee 3 – Transmission

Natural gas transportation systems are of vital importance. New systems need to be designed to transport large quantities of gas economically in an environmentally friendly way, while existing systems need to be upgraded to avoid accidents. We therefore need to focus on pipeline integrity. Other important issues for WOC 3 include compressor stations, as these are a part of the transportation system. We have set up three study groups to address the issues.

SG 3.1 *New transportation projects*

All new gas transportation projects are complex and unique due to their specific characteristics. SG 3.1 will gather information on new gas transportation projects (pipelines and compressor plants) to analyse the proposed solutions and exploit the best industry construction practices.

SG 3.2 *Integrity management systems (IMS)*

It is necessary to enhance integrity plans and introduce an asset management approach to reduce the risks of failure and accidents. SG 3.2 will look at strategies that support effective IMS HR issues. In addition, it will be responsible for building and maintaining a database of IGU members' transmission systems, containing information on transmission networks (physical data, performance, projects, new rules, etc.).

SG 3.3 *Public acceptance and new technologies*

The time has come to obtain the best public acceptance of gas transmission systems. That is why SG 3.3 will analyse gas industry growth from two production chain perspectives: firstly, the legal requirements surrounding the provision of new unconventional gas sources (shale and other indigenous sources of gas) such as environmental, economic or other factors; and secondly, the new gas industry technologies used to transport greater quantities of gas in a safe and reliable way.

WOC 3 held its first meeting in Mar del Plata, Argentina, October 24-25, 2012.

Working Committee 4 – Distribution

Gas distribution covers the part of the gas chain that is most visible to the end client. To encourage clients to choose gas as their source of energy, it is important that gas distribution services are perceived as being competitive and of top quality.

In many countries, regulations are becoming increasingly important. Some of the requirements include:

- ◆ Third-party access is a pre-requisite in many countries, but the conditions often vary enormously from country to country;
- ◆ Regulatory authorities are also demanding that services be unbundled on a distribution level, despite the fact that they usually comprise a far more detailed grid structure;
- ◆ Diversified gas supplies: moving away from a single or possibly dual quality gas supply distribution grid to a multiple supply grid with many entry points;
- ◆ The political decision-making trend is to move towards carbon-free energy supplies leading to other regenerative sources of methane gas supplies and even to non-carbon combustible gases in the system;
- ◆ To improve the quality of customer service, more electronic measuring equipment and control tools are being introduced to create "smart grids" and industry personnel will require appropriate training and qualifications to use such tools.

WOC 4 will assess the factors that will have an impact on our immediate future and three study groups have been set up.

SG 4.1 *Regulation of third-party access to gas distribution networks – A standard approach*

In most IGU member countries, national governments have introduced regulatory measures that affect the entire energy industry. SG 4.1 will examine how the regulation of third-party access to gas distribution networks has been developed over the past decade, with



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emphasis on different developments in the member countries. The long-term objective is to develop an IGU Network Code.

SG 4.2 Diversification of gas quality and non-conventional sources in a carbon-free future

Traditionally, distribution grids comprised one or possibly two sources of supply, based on long-term delivery contracts. This is changing in many parts of the world with new sources of gas. SG 4.2 will examine the different options available for managing a diversification of gas quality, and ways distribution companies can address the growing challenge to secure stable gas supplies for their customers.

SG 4.3 Smart Grids in gas distribution: Scope and purpose

Smart grids are a widely discussed issue in the gas industry. Based on smart gas meters that were the object of a WOC 4 study during last triennium, SG 4.3 will examine the options available for further developing smart gas distribution grids.

WOC 4 held its first meeting in Cologne, Germany, October 11-12, 2012.

Working Committee 5 – Utilisation

Chaired by Eugene Pronin (Gazprom Export, Russia), WOC 5 monitors existing and future uses of gas to further develop the global gas market and improve our customers' quality of life. Customer testimonials, best practices, promising technologies and future potentials relating to gas use will be researched and the findings distributed worldwide for the benefit of end-users.

WOC 5 has 73 members. It is divided into three study groups and two topic teams, which have the common aim of advocating broader use of gas as well as individual tasks.

SG 5.1 Industrial utilisation

Leader: Egidio Adamo, (Eni, Italy)

During the triennium, SG 5.1 will prepare a report on trends in industrial gas usage, gather information on natural gas technologies, compare international energy efficiency initiatives, explore combining natural gas with renewables, study gas-to-power technologies and techniques and investigate the role of energy services in industry.

SG 5.2 Domestic and commercial utilisation

Leader: Martin Seifert (SVGW, Switzerland)

SG 5.2 will prepare a report on new gas appliances, monitor the promotion of gas heat pumps and micro-CHP units, research gas appliances with condensing and modulating properties for use in combination with other appliances such as electric heat pumps (hybrid systems), monitor adsorption heat pumps, study "smart" micro-CHP features and check and research business models for new technologies and associated services.

SG 5.3 Natural gas vehicles (NGVs)

Leader: Olivier Bordelanne (GDF Suez, France)

SG 5.3 will promote the use of natural gas as a transportation fuel to create cleaner, safer and cheaper mobility solutions. Its tasks include preparing the Global 2012-2015 NGV Report,

▼ WOC 5's first meeting of the triennium was chaired by Eugene Pronin (second right) in Moscow in November 2012.





proposing an action plan for NGVs in Europe (5% market share in 2020/2025) and researching CNG/LNG/biomethane technologies, economics, local policies and incentives. SG 5 will cooperate with NGV Global.

TT 5.1 Renewable energy, CO₂ emissions, hydrogen

Special Adviser: Aksel Pedersen (Dong Energy, Denmark)

TT 5.1 will gather information about global production and use of "green gases" in association with natural gas, investigate how renewables can be incorporated into the natural gas grid, look at hydrogen/methane production from renewable power, study electrolysing technologies and look at technologies to convert CO₂ + water to methane. It will also prepare a global overview of ongoing projects for the integration of renewable gas into the local natural gas grid – including a status check on technology upgrades.

TT 5.2 Gas quality

Special Adviser: François Cagnon (GDF Suez, France)

TT 5.2 will gather information on worldwide gas quality issues, collect data on new regu-

lations or initiatives to standardise gas quality, study the impact of gas quality variations on existing appliances and new technologies, and review the effects of adding hydrogen or new gases to the grid.

Transversal issues

WOC 5's work on spreading the benefits of gas relates to the transversal theme of gas everywhere (the red pillar) and it will cooperate with PGCs C and E. As regards combining with renewables and electricity (the yellow pillar), WOC 5 will cooperate with PGC F on securing synergy of natural gas with biomethane, hydrogen and renewables. Work on sustainable development issues (the green pillar) such as investing in infrastructure and improving technologies will involve liaison with PGCs A, D, E and F and GERG. Finally, on human resource issues (the blue pillar) WOC 5 will cooperate with TFs 1 and 2.

Meetings

WOC 5's first meeting was hosted by Gazprom in Moscow, Russia, November 13-14, 2012. It was attended by 54 members. The next meeting will be hosted by GTI and Westport in the USA in April, just after LNG 17.

▲ WOC 5 members pose for a group picture during their technical visit to Gazprom's combined heat and power plant in Moscow.

Programme Committee A – Sustainability

The gas industry has to secure the supply, safety and environmental integrity of the natural gas chain, from exploration and production to end use. Chaired by Satoshi Yoshida (Tokyo Gas, Japan), PGC A has set up four study groups to address these issues.

SG A.1 Carbon capture and storage

Leader: Hiromichi Kameyama (Tokyo Gas, Japan)

SG A.1 has six members from Algeria, France, Iran, Japan and Malaysia. It collaborates with WOC 1 on geological issues, WOC 2 on storage and WOC 3 on CO₂ pipeline issues. During the first year of the triennium, information on ongoing and planned CCS projects will be collected as regards their technology, feasibility, legal framework and public acceptance. In the second year, the critical factors for the development of CCS for gas will be evaluated and a CCS roadmap will be developed. The third year will be dedicated to finalising the report and presentation for the 26th WGC.

SG A.2 Natural gas and renewable gas

Leader: Elbert Huijzer (Liander, The Netherlands)

SG A.2 will look at the quality standards and economic aspects of renewable gases and carry out a life-cycle analysis (LCA). Case studies will be conducted, including off-grid bio-methane project studies in developing countries, while the LCA task will involve an environmental and social impact assessment. SG A.2 will collaborate with PGC F to look at an integrated grid and produce a vision document on integrated energy services. The study group has seven members but is looking to recruit more to carry out its work programme.

SG A.3 Life-cycle analysis of the natural gas chain

Leader: Anne Prieur-Vernat (GDF Suez, France)

SG A.3 has seven members from Algeria, Belgium, France, Iran, Japan and Korea. It will establish a framework for data collection (the first questionnaire has been circulated to collect environmental data) and create an international LCA database for the natural gas chain. The work is based on a Marcogaz-Eurogas study and will benefit from exchanges with other study groups and committees. In particular, SG A.3 is collaborating with WOC 3 on transmission issues and PGC D on LNG.

SG A.4 Environmental aspects of unconventional gas

Leader (and PGC A Vice Chair): Mauro Soares (Tecpetrol, Argentina)

SG A.4 will examine the environmental impact associated with unconventional gas and document best practices. It has six members from Algeria, Iran, Japan and Korea, and an observer from ExxonMobil Gas & Power Marketing attended the first meeting. SG A.4 collaborates with WOC 1 on the latest exploration and production technologies and with WOC 3 on public perception and infrastructure issues.

▼ CC Chair Georges Liens performs "Mochitsuki", the traditional Japanese rice cake pounding ceremony, during the joint PGC A/WOC 1 meeting in Sapporo. This ceremony forms part of New Year celebrations in rural areas and is also popular when welcoming friends.





◀ PGC A and WOC 1 delegates on a technical tour to the new LNG import terminal in Ishikari, Hokkaido. Owned and operated by Hokkaido Gas Company, the terminal started operations in October 2012.

Meetings

PGC A held its first meeting of the triennium in Sapporo, Japan, September 26-28, 2012, which was attended by 33 members. This was a joint meeting with WOC 1 as was the second meeting, which was held in Rio de Janeiro, Brazil, February 18-21.

PGC B – Strategy

Under the chairmanship of Fethi Arabi (Sonatrach, Algeria) PGC B's principal objectives are to analyse the forecasts, policies and economics affecting regional and global gas supplies, demand and trade; to examine wholesale gas price formation and gas pricing trends for both indigenous production and international trade; to share information on company strategies in relation to commercial and regulatory change; and to coordinate work

on the 2050 natural gas prospective. There are three study groups.

SG B.1 World gas supplies, demand and trade

As a first step, SG B.1 will develop gas demand and gas production scenarios to 2035 for each of the eight world regions defined by the IGU. Group members acting as "regional focal points" were nominated during the first meeting and have started their work. Based on these regional forecasts, different scenarios will be developed, inter alia taking into account the development of alternative and renewable energy sources, economic growth forecasts and the global development of unconventional gas and oil production. Additionally, SG B.1 will identify and elaborate on "hot topics" for the global gas industry.



▲ Delegates pose for a group photograph at the joint meeting of PGC B and PGC C in Oran.

SG B.2 Wholesale gas price formation study

SG B.2 will assess the alternative methods for indexing wholesale gas prices (oil, spot gas price, coal, etc.) and their impact on power generation baseload choices. Taking account of government/regulatory involvement in wholesale price setting in consuming and producing countries, it will assess the true extent of subsidies, the conditions required for fully traded gas markets and recent contracting trends. Five main issues will be covered: price indexation; state involvement in wholesale prices; traded gas markets and contracts; a wholesale gas price survey; and globalisation of gas prices.

SG B.3 Strategy and regulation

SG B.3 will identify the potential for cooperation between natural gas players with a focus on success stories involving IOCs, NOCs and service providers, and assess the effects of globalisation on the world gas supply chain, by understanding how industry structures will evolve and how this will affect the number of firms in the gas business. SG B.3 will also analyse strategies to cope with market uncertainties and the impact of energy efficiency on corporate strategies.

PGC-B will also undertake the 2050 Natural Gas Prospective Study. This will focus on qualitative aspects affecting the 2030 supply/demand study of the previous two triennia. It will look at qualitative rather than quantitative issues and in particular at very long-term future issues, and assess disruption possibilities.

PGC B held its first official meeting jointly with PGC C on November 27-28, 2012 in the beautiful coastal city of Oran, Algeria. The meeting was well attended with more than 50 delegates.

PGC C – Gas Markets

The basic objective of PGC C is to identify and analyse the emerging issues and key market drivers facing developed and developing gas markets, and to provide insights into how those gas markets can be promoted. Under the chairmanship of Dr Gi Chul Jung (KOGAS, Korea), PGC C has revised the study topics originally set out in the Triennial Work Programme and has now set up two study groups:

SG C.1 The role of natural gas in the electricity generation mix

Leader: Alexey Biteryakov (Gazprom, Russia)

SG C.1 will analyse changes to the electricity generation fuel mix, their impact on the supply-

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.

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Cameroon has proven natural gas reserves estimated at 157 billion m³, for a potential of 570 billion m³. The National Hydrocarbons Corporation (NHC) has implemented various projects to develop this important resource.

Supply of gas to the Kribi thermal power station

The project to supply gas to the thermal power station is an initiative of the NHC and its partner Perenco. The purpose of this project is to produce natural gas from the Sanaga Sud offshore field to supply the kribi thermal power station. The natural gas, processed onshore, is delivered by an 18 km gas pipeline to the thermal station, implanted at Mpolongwe. The volume of gas to be supplied to the 216 MW station is 5.8 billion m³.



Supply of gas to the industries of Douala

The natural gas reserves of the field Logbaba, located in the suburbs of Douala (Coastline Region), will be used to supply gas to local industries.

Supply tests were performed successfully since June 2012 with three companies based in the industrial area of Bassa (Douala), who have converted their burners to gas. More than twenty industries have expressed interest in the use of natural gas as an energy source.

National Hydrocarbons Corporation

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▲ PGC C delegates during a working session with their Chair, Dr Gi Chul Jung at far right.

demand balance and prices in different gas markets, and examine the implications for emerging gas markets.

SG C.2 Implications of developing unconventional gas (UCG)

Leader: Shigeki Sakamoto (JX Nippon, Japan)
SG C.2 will identify the supply potential and characteristics for unconventional natural gas resources worldwide, analyse changes in government policies and energy mixes in countries with abundant UCG resources, identify the issues and challenges in relation to developing UCG and analyse the potential impact on the gas supply demand balance and prices in regional and global gas markets.

In addition to these two studies, PGC C has been requested by the French Presidency to prepare a special report together with TF 3 and PGC A on the topic "Natural Gas, a Key Factor for Sustainable Development in Emerging Countries". The preparation of this report will be discussed with relevant parties and committees.

PGC C held its first official meeting jointly with PGC B on November 27-28, 2012 in Oran, Algeria. Hosted by PGC B's Chair, Fethi Arabi with the full support of Sonatrach, the meeting was well organised and the venue, Le Méridien Hotel was perfect with a gorgeous view of the

Mediterranean Sea. It was attended by 21 PGC C members (out of a total membership of 55) from 11 countries, namely Algeria, Australia, France, Iran, Japan, Korea, Norway, Poland, Russia, Tunisia and the UK. Some members from Croatia, Poland, Trinidad and Tobago and Tunisia, who could not travel to Oran, have promised to join the second meeting in Korea.

PGC C is one of the smaller committees so it is easier for newcomers to get to know the oldtimers. After just two days in Oran, every member felt part of the family. They promised to meet again in the second PGC C meeting, which at press time was scheduled to be held in Jeju Island, Korea, March 19-22.

The Jeju meeting will also be a joint one with PGC B. It will be hosted by Dr Gi Chul Jung with the full support of Korea Gas Corporation (KOGAS) and Korea Gas Union, the IGU Charter Member for Korea. Jeju is a beautiful volcanic island which was selected as one of the new seven wonders of nature in 2011. Indeed, Dr Gi Chul Jung encouraged all PGC C members during the wrap-up session in Oran to bring their spouses and have a second honeymoon in Jeju, where he himself honeymooned in 1985. The PGC C Chair also invited Georges Liens, CC Chair, and Yves Tournié, CC Secretary to attend the meeting.

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Taking care of the environment where we live, work and grow.
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▲ PGC D delegates pose for a group photograph in The Hague with their Chair, Dirk van Slooten at centre.

PGC D – LNG

The LNG sector has experienced phenomenal growth and significant evolution in the last decade. Once primarily focused on the Pacific Basin, LNG trading is now a truly global business. The international financial crisis has presented new challenges, but the business is a resilient one and there are many new opportunities such as the use of LNG for fuelling ships and heavy goods vehicles.

Under the chairmanship of Dirk van Slooten (Vopak, The Netherlands), PGC D's role is to monitor and promote the development of the LNG business. Five study groups have been set up.

SG D.1 Remote LNG

Leader: Jean-Yves Capelle (Total, France)

An increasing number of LNG projects are being considered in higher latitudes in countries such as Norway and Russia, or offshore in Arctic conditions. These projects demand a special approach in terms of design, construction and operations. SG D.1 will evaluate the challenges that face LNG projects in places with extreme weather conditions and remote regions, and make recommendations for future developments.

SG D.2 LNG as fuel

Leader: Richard Lammons (Chevron, USA)

Using LNG as a transportation fuel reduces the emissions of CO₂ and other pollutants (NO_x and SO_x) compared to oil-based fuels. SG D.2 will look at the opportunities for LNG in the trucking and marine sectors. Its work relates to the transversal theme of sustainable development (the green pillar).

SG D.3 Small-scale LNG

Leader: Wouter Meiring (Shell, The Netherlands)

SG D.3 will highlight regions/countries which could benefit from LNG supplies but are not easily accessible by large LNG carriers, and provide an overview of the technical requirements for small-scale LNG projects. The solution involves breaking bulk in a large receiving terminal (hub) and using smaller vessels to serve satellite receiving terminals. This study group's work relates to the transversal themes of gas everywhere (the red pillar) and sustainable development (the green pillar) in as much as bringing gas to new markets can displace more polluting fuels such as coal and wood.



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FBM Hudson Italiana hold proven and trusted experience and, in the perspective of the ever growing global demand for LNG, have developed a new modular concept in particular for Air Cooled HE.

FBM Hudson Italiana boasts its position as a leader in thermal design thanks to the optimisation of fans' air side performance (i.e. different blades, linear or twisted blades, etc.) along with the optimisation and integration of steel structures, strictly in compliance with clients' specific requirements.

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Our extensive experience in this area allows us to tailor-make equipment according to clients' specific objectives and by studying enhanced and innovative solutions. This involvement has led us to improving performance in the evolution of modularisation, which aims at obtaining bigger and bigger modules by extending the inclusion of pre-assembled components.

Therefore, not only the AFC modules alone, but also piping, instrumentation and electrical wiring can now be considered as a whole, unique pre-assembled module.

FBM Hudson Italiana, working closely with major EPCs, has met the challenge in moving to world-class projects, using advanced technology to power an **"off the shelf"** design & technology modularisation concept.

This new concept leads to faster construction and faster LNG to market, while also maximising field construction by fostering a **"plug and play"** solution.

Moreover this enhanced concept facilitates the incorporation of additional **"perfect-fit"** modular LNG trains to add capacity to an existing LNG facility to suit gas field needs.

FBM HUDSON ITALIANA SpA

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▲ Dirk van Slooten addresses a session during PGC D's first meeting.

SG D.4 LNG life-cycle analysis

Leader: Ted Williams (American Gas Association, USA)

Life-cycle analysis (LCA) is a tool formalised through two international standards (ISO 14040 & 14044) and recognised by governments, NGOs and customers. It seeks to quantify the potential impacts of a product, service or process from the extraction of the raw materials that compose it, to its elimination at the end of its life, through stages of distribution and use. SG D.4 will carry out a detailed life-cycle analysis of the LNG chain to map the environmental impacts, provide reliable data for comparison of LNG to other types of fuel for transportation use and identify potential improvements.

SG D.5 Annual World LNG Report

Leader: Philippe Corbière (Total, France)
IGU's *World LNG Report* was launched by the Malaysian Presidency in the last triennium. SG D.5 will continue the work on this important report which provides information on LNG liquefaction plants, LNG carriers and regasification facilities.

Meetings

PGC D's first meeting was hosted by Shell in The Hague, The Netherlands, October 2-5, 2012. The next meeting will be held just before LNG 17 in Houston, USA, April 14-16.

PGC E – Marketing and Communication

PGC E has a two-fold objective. Firstly it will identify and develop the ideas, tools and products needed to successfully promote and sell natural gas. Secondly, it will define effective communication methods that will convey the benefits of natural gas and its role in sustainable development and a clean economy. There are three study groups.

SG E.1 Marketing natural gas and promoting new usages

Leader: Luis Pinto (Shell, The Netherlands)
SG E.1 will analyse international marketing and promotion campaigns for the use of natural gas. The analysis will pay special attention to campaigns designed to expand the network to new households, industrial clients, NGVs and new applications (micro-generation, solar-gas, etc.). Case studies from group members will provide a best practice resource. SG E.1 will collaborate with TF 2.

SG E.2 Competing and coordinating with other energies

Leader: Barbara Jinks (Gas industry advisor, Australia)
SG E.2 will analyse the energy sector's advocacy activities and their results, focusing mainly on coal, oil, nuclear and renewables. The report will analyse the organisation and coordinate communication activities for each type of energy. It will also identify the prime audiences, key channels, topics and arguments. SG E.2 will further analyse how each type of energy (coal, oil, nuclear, renewables, others) uses marketing and promotion to increase business and attract new customers.

SG E.3 Communication and public acceptance of natural gas projects

Leader: Hansch van der Velden (Gasunie, The Netherlands)
SG E.3 will produce a marketing and communications handbook for local use. Special



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More natural gas for a cleaner future



CNPC

▶ PGC E delegates pose for a group photograph in Barcelona.



attention will be given to the impact of unconventional gas development on communications activities. Members will provide case studies of successful initiatives as models for maintaining a constant flow of communications to improve the image of natural gas. SG E.3 will also develop a handbook for international use.

i-gas Industry: Contribution to a special report

Leader: David Konvalina (RWE Transgas, Czech Republic)

A transversal topic will be covered by all study groups looking at the impact of online and new media on the gas industry. PGC E also aims to continue work on the 2011 “IGU Online Proposal” report produced by SG E.3 in the previous triennium.

Meetings

PGC E’s first meeting was hosted by Gas Natural Fenosa, in Barcelona, Spain, October 1-3, 2012. It was attended by 33 of the committee’s 54 nominated members. The next meeting will be held in Paris, France, March 25-27.

PGC F – R&D and Innovation

The goals of IGU’s newest technical committee, PGC F include fostering information exchanges and international collaboration on research and innovation, promoting best practices and

raising awareness of how research and innovation promotes the growth and sustainability of the global gas industry. The committee is chaired by Dr Jack Lewnard (GTI, USA).

A principle deliverable for PGC F is the next IGU Research Conference (IGRC2014). Study Group F.1 is responsible for developing the conference’s technical programme and is working with the National Organising Committee to refine the topics that will comprise the call for papers and, ultimately, the conference topics and programme structure. The IGRC2014 Conference Director has contributed a separate article on preparations for this important event (see pages 84-85).

PGC F has two other study groups: F.2 will characterise worldwide gas R&D facilities, capabilities and programmes; F.3 will focus on the issues and considerations for natural gas convergence with renewable and electric energy. PGC F developed and hosted a workshop on this topic during the CC meeting held in Ottawa, Canada in October 2012. This workshop included support and input from PGC A, as well as insights and contributions from representatives of the electric and renewable industries, the World Bank and other global energy interests.

PGC F held its first meeting in Copenhagen, Denmark, October 2-3, 2012. At press time the next meeting was due to take place in Amsterdam, The Netherlands, March 26-27.



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to a new era of
progress!

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Natural Gas - Growth for Greece

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 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 and also participates in ICGB AD, the company that will undertake the development and operation of the pipeline connecting Greece with Bulgaria.

DEPA works for the further expansion of natural gas grid in Greece so that each day more people all around the country welcome a better world with a warm kalimera!



Progress Reports from the Task Forces

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

Task Force 1 – Human Capital

Studies and surveys of industry leaders show that the ageing of the workforce has become a key issue for the gas industry and a potential threat to the development of clean energy and meeting future energy demand. The shortage in human resources is felt across the industry and the root cause can be attributed to two critical factors. The first is a fall in the influx of students into STEM (science, technology, engineering and mathematics) streams; and the second is a lack of interest from school leavers and graduates in joining the industry as it is perceived to be less trendy than other sectors and less environmentally friendly. Given the number of workers in or approaching retirement age, this will create a shortage of skills. The industry will be pressed to find skilled workers to meet

demand and become more reliant on professionals who have passed retirement age.

Unless a serious and deliberate effort is made to change these circumstances the industry will be adversely impacted on all fronts and societies will miss the opportunity to realise the economic and environmental benefits of natural gas.

As discussed in its first meeting, which was held in Doha, September 18-20, 2012, the main focus of TF 1 in this triennium will be on developing tools to attract talent to the gas industry. We aim to concentrate on accessing untapped/underused pools of talent, namely young people and women.

Objective 1 – Report/booklet

Overview – While the industry may face a lot of challenges, there are also great success stories. There are a lot of pockets of excellence and best practices across the industry where companies have managed to tackle these challenges either locally in the countries they operate in or internationally. It is essential that such best practices are shared across the industry for us to be able to tackle this challenge successfully.

Deliverable – Therefore, it is suggested that TF 1 produces a report analysing the situation of young people and women in the industry, which shares and highlights best practices across the industry in the area of Human Capital Development. This report will be a collection of survey-based research and interviews with companies, female workers and young people in the form of a booklet. It will be either launched and managed by the task force members collectively or prepared by a

▼ Vice Chair Abdulaziz Mohammed Al-Mannai addresses TF 1's first meeting in Doha. TF 1's Chair, Agnès Grimont is listening.





specialised consultancy under the supervision of TF 1 members. The aim of the booklet will be to focus on the unique things organisations do to excel in the area of Human Capital Development, especially in attracting women and young people. Detailed terms of reference will be presented to the task force for discussion and inputs.

Outcome – This booklet will be a tangible demonstration of TF 1 deliverables and will be published and distributed across the industry to share best practice.

Objective 2 – Female Campaign

Overview – Despite the fact that the majority of diploma holders are women, in the gas industry female employees are a minority in almost all companies around the world, with their participation lower in some regions than others. This is an immense talent pool that the gas industry has been ignoring for a long time and cannot

afford to do so any longer. We wish to consolidate the current participation of women in the workforce and encourage the industry to become more female friendly in order to attract greater numbers of talented women.

Deliverables – In coordination with Task Force 2 – Gas Advocacy, we will develop a promotional campaign highlighting success stories of female workers in the gas industry. This campaign will include articles in the IGU Magazine and YouTube videos in which female role models speak about their experiences and roads to success. (Articles and videos will also be included in the WGC 2015 Youth Pavilion.)

Outcome – As well as preparing a report sharing best practices on attracting women to the industry, we will develop tools to consolidate the participation of women in the workforce and make the industry more female friendly.

▲ TF 1 members pose for a group photograph during a technical visit to Qatargas.

Objective 3 – Youth Campaign and Youth Pavilion

Overview – One effective way of changing young people’s perception of the industry is to educate and communicate. We will continue the good work done by TF 2 in the previous triennium and run an educational awareness campaign through social media (e.g. Facebook, LinkedIn, Twitter). This is a very good way of reaching out to young people to help them understand the important role the gas industry plays in the world. The campaign will be aligned with TF 2’s work and it is likely that it will be supervised by the team members but outsourced to a specialised agency for day-to-day management. In parallel, we will organise a Youth Pavilion at WGC 2015, following the very successful Youth Programme organised by TF 2 during WGC 2012 in Kuala Lumpur.

Deliverables – An educational campaign targeted at young people and aiming to change their perception of the industry will be carried out throughout the triennium, aligned with TF 2. (A report on the campaign and the interest it generates will be produced at the end of the triennium). A Youth Pavilion will be organised for WGC 2015.

Outcome – In addition to the report on best practices to attract young people to the industry, we will take action and will play an active part in communicating and involving youth with the industry.

Task Force 2 – Gas Advocacy

Chaired by Michele Pizzolato (Eni, Italy), TF 2 aims to endorse the essential role of natural gas in the forthcoming transformation of the energy system. It has been established to be the “voice” of natural gas in the institutional and regulatory forums of interest and to coordinate support and promote this position. For this process to be effective, it is important to develop an overall IGU vision of the role of

natural gas and subsequently develop targeted messages based on the following basic elements:

- ◆ Structure of the energy market, with particular reference to factors such as the maturity of the market, degree of regulation, gas-to-gas competition and inter-fuel competition;
- ◆ Cultural evaluation of natural gas (taking into account the results of the analysis carried out by PGC E during the 2009-2012 Triennium); and
- ◆ Type of stakeholder, e.g. national authorities, governments, financial institutions.

Considering that natural gas will play a fundamental role as a key fuel in the long-term energy mix, TF 2 intends to stimulate debate on a range of issues.

Role of natural gas in the fuel mix

The characteristics of natural gas make it an important player in the future fuel mix. Affordability and reliability are crucial factors in markets where access to energy is a major issue. Where competition is a central element, the flexibility of natural gas could be a strategic factor. Finally, since natural gas is the ideal partner for renewables, it is a viable fuel even in those economies facing the challenge of eliminating fossil fuels.

Role of natural gas for security of supply

There is a fundamental need for investment upstream and in infrastructure and proper regulation (with a particular focus on relations between the bankability of investments and security of supply).

Policies with direct and indirect impacts on inter-fuel competition

Major impacts on the natural gas market could be caused by the design of incentives to develop renewable energy sources, and mechanisms to evaluate and trade CO₂ emissions, as well as policies on technological research and fuel taxation configurations.



◀ TF 2's first meeting was hosted by Eni in Milan.

Technological development

Investments in technologies such as carbon capture and storage, residential gas heat pumps and biogas are important elements in the forthcoming market transformation.

TF 2 will use this triennium to encourage area representatives to help develop IGU's strong internal collaboration with technical entities and PGC E on communication activities.

Outside IGU, the main objective is to strengthen relations with institutional stakeholders. TF 2 intends to present the IGU vision of the role of natural gas in the energy mix to all the organisations that, in different ways, help to define energy policy, including: national authorities, governments, financial institutions and regional bodies. TF 2 will also prepare position papers on the key stages of the decision making process (e.g. public consultations).

TF 2 held its first meeting in Milan, Italy, October 11-12, 2012, which was attended by 23 delegates out of a total membership of 35. Work is underway on a position paper on capacity payment, a document for institutional stakeholders on the reduction of greenhouse

gases (GHG), a document on shale gas and stakeholder mapping. Work will start soon on inter-regional trading of CO₂ and gas as a motor fuel. These issues relate to the strategic framework of the triennium as follows:

- ◆ Yellow pillar (combination with renewables and electricity): capacity payment;



- ◆ Blue pillar (human resources): document for institutional stakeholders on GHG reduction;
- ◆ Green pillar (sustainable development): inter-regional trading of CO₂ and gas as a motor fuel;
- ◆ Red pillar (natural gas available everywhere): shale gas.

The next meeting will be held in St Petersburg, Russia, May 16-17.

Task Force 3 – Geopolitics

Though natural gas may be abundantly available worldwide, not every region is equally endowed with this resource. Getting the gas from the regions where it is produced to where it is consumed can prove to be a challenge. The actions taken by nation states and/or international organisations to influence international gas flows to their benefit can be understood as geopolitical actions. TF 3's aim is to better understand these actions and to identify key developments worldwide that define the geopolitical setting, the so-called game changers.

Under the chairmanship of Geert Greving (GasTerra, The Netherlands), TF 3 will continue the work of the previous triennium with a few notable changes in scope:

- ◆ It will not focus on politics exclusively, but also on economic issues. So not only geopolitics, but also geoeconomics;
- ◆ Its coverage will expand to the Far East, the Americas and Africa, with a special focus on south-south interaction and developments in the Pacific region;
- ◆ Cooperation along the value chain (upstream to downstream) between national oil corporations and international oil corporations will be studied.

TF 3 also aims to finish the global round of debates by including the regions that were not covered in the previous triennium and where possible to strengthen the ties of IGU with regional authorities. The debates will take place in high-level meetings between experts, governmental representatives, local authorities

and industry representatives. Traditionally, IGU has been focused on the industry – although the gas advocacy initiative is changing this – and the debates are a way of connecting all stakeholders to our project. The conclusions of each meeting will be presented in a regional discussion paper, prepared by the local moderator, which will be published in the IGU magazine. In addition to these regional discussion papers, a major study of natural gas and geopolitics will be carried out by the French think-tank IFRI (Institut Français des Relations Internationales) and the Dutch think-tank CIEP (Clingendael International Energy Programme). Together these reports will make up a final report to be presented at the 26th WGC in Paris in 2015.

Although the first meeting was not held until February 14 in Paris (and will be covered in the next progress report), our work has been underway since the start of the triennium. In our efforts we have focused on discussing the above outlined goals and organised a workshop during the meetings of the Executive Committee and Council in October 2012 (see below), while the expert team from CIEP and IFRI prepared a short study for the first meeting on “The new geopolitics of natural gas”. We have also started online battles for students and young professionals to engage them with our project and with IGU. This initiative addresses the transversal theme of human resources (the blue pillar). In the battles we ask students and young professionals to write down their views on a pre-determined topic in a paper. The best contestants earn a seat at one of the regional meetings we organise. There will also be a college tour in which experts present their views on the geopolitical situation in a region in a half-day programme at a university in the city the regional meeting takes place. The first of these meetings is scheduled to take place in Washington DC in June, where the future role of North America in the global gas market will be discussed.



We have secured sponsors who will support our project in this triennium and are happy to welcome Gazprom, Chevron, Eni, TAQA Arabia, the Royal Dutch Gas Association (KVGN) and GasTerra.

Is There Room Enough for Both of Us?

By Timothy Egan and Rik Komduur

During the meetings of the Executive Committee and Council in Ottawa last October, geopolitics was addressed in a special workshop – the first of its kind under the new French Presidency. For us, as members of the Task Force on Geopolitics, the event provided an opportunity to solicit views on what colleagues around the world consider the greatest geopolitical challenges to the current gas market(s).

The geopolitics of natural gas is a rather difficult subject to grasp. A study on the topic carried out by TF 3 in the last triennium offered some explanation as to why, highlighting the fact that issues are more often regional than global, and noting how it is often difficult to distinguish political, geopolitical or geo-economic factors. Pipeline gas, for example, is often

more subject to direct political intervention than LNG, but has on the other hand a far more limited geographical scope. Another thing is that natural gas is often both subject to and an instrument of geopolitics. This sometimes makes it difficult to have a discussion in which all the participants are on the same level.



▲ Robert Lesnick of the World Bank (*second from right*) answers a question from the floor during TF 3's geopolitics workshop in Ottawa. On the top table with him are Timothy Egan (*far right*), David Byers of the Australian Petroleum Production & Exploration Association (*far left*) and Keith Triginer of GE Oil & Gas Canada.

◀ Gertjan Lankhorst of GasTerra, who is IGU's Regional Coordinator for Europe, addresses the workshop.

Challenges aside, a group of stakeholders from different backgrounds and positions in the industry came together in Ottawa for what proved a very stimulating discussion on the topic.

A point made in most of the presentations and underscored in the discussion is that the world gas market is really best characterised as three regional markets with limited inter-connection. The most obvious indicator of this reality is price – the commodity costs vary significantly from one region to another. The North American market, with its ample natural gas production (conventional and unconventional), is self-sufficient in its supply and gas prices – more or less consistent across the continent – are the globe’s lowest. European prices are in the middle, and while Europe has some indigenous production and the potential for more, it is not self-sufficient and draws gas via pipeline from Russia and North Africa, and to a lesser extent via LNG from North Africa and the Gulf region. The Asia-Pacific market is highly dependent on LNG imports, mainly from the Middle East and Russia, has significant resources but limited development of them, and has the highest prices.

The outlook for gas in each of these markets is also different. In Europe natural gas struggles to maintain its position as other fuels are now more cost-competitive, especially in power generation. The uncertainties surrounding issues like the EU emissions trading system (ETS) and the attitude of policymakers regarding import dependency further complicate the situation. In the North American market the outlook is very bright for both gas producers and gas consumers, with producers looking seriously to LNG export opportunities (principally to Asia) and consumers looking to grow their gas dependence as a means to drive affordable environmentally-sound economic growth. The Asia-Pacific markets, in the midst of very significant economic growth, need and want gas – they are expected to grow from an

already large share of 60% now to 70% of global LNG demand within the next five to 10 years. The pressure this is expected to put on prices is the subject of much interest to current and potential suppliers. Australia, which is set to take over from Qatar as the world’s largest LNG exporter by the end of this decade, is well-positioned to capitalise on the opportunity. These current LNG producers are expected to be joined by East African and North American suppliers in the near future, and Russia has been moving aggressively of late to play a stronger role in the region. A key question is which suppliers will get the quickest access to the lucrative long-term contracts. In the words of one potential exporter to another: Is there room enough for both of us?

For us, as members of the Task Force on Geopolitics, even tracking the developments is a challenge. As we look forward several questions come to mind. Will resource nationalism prevail over free trade? How will the politics of environment around unconventional resources play out region by region? How will new global trade movements accommodate transportation bottlenecks? What level of inter-regional trade might emerge as more nations become exporters? And last but not least how will all this affect access to natural gas in regions that so far have been excluded from this?

The global gas market is growing and our assessment is that it will more than likely be big enough for many exporters. But what that market will look like in five, 10 or more years and who ends up where is anybody’s guess. We hope our continued engagement on the issues will help all IGU participants deepen their understanding as we all work to build the role of natural gas worldwide.

Timothy Egan is the President & CEO of the Canadian Gas Association and Rik Komduur of GasTerra is the Secretary of Task Force 3.



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Shell led the industry when it committed to develop a Floating Liquefied Natural Gas (FLNG) facility last year. FLNG allows us to access sources of natural gas, the cleanest burning fossil fuel, that used to be too challenging to produce. Shell's first FLNG facility will be located above the Prelude gas field, more than 200 km off the coast of Western Australia. When built, it will be the world's largest floating offshore facility, equivalent in length to more than four football fields. Shell's ability to deliver this pioneering project is typical of our innovative approach to creating a better energy future. Let's power our future with gas.



LET'S GO.

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Global energy demand and the role of gas

Global energy outlook

The world's population is expected to grow to over eight billion by 2030 from seven billion today. In addition, GDP per capita is expected to triple by 2030 in India and China. Developments such as these will mean that more than 2.5 billion people will reach a much higher position on the energy ladder in the coming decades. At Shell we predict that energy demand could double in the first half of this century, with nearly all of that growth coming from non-OECD nations.

The world will require continued investment in all forms of energy to keep up with this rapid demand growth. The International Energy Agency estimates that \$620 billion per year will need to be invested by the oil and gas industry alone to match the demand growth in the coming 20 years.

The role of gas

With this strong growth in energy demand, there is more focus than ever before on gas as a preferred energy source. Natural gas is, in many ways, the ideal fossil fuel. It is abundantly and reliably available, the cleanest burning hydrocarbon, easy to transport,

convenient and affordable. Gas can play a key role in mitigating climate change – replacing coal with gas in Europe, North America, China, India, Japan and Korea would be the surest, fastest and cheapest way to reduce CO₂ emissions over the next 10-20 years.

We expect to see global gas demand grow by over 60% from 2010 to 2030, or 2-3% per year, driven by demand growth in Asia, the Middle East and the Americas, primarily in the power and industrial sectors.

Gas is the fuel of choice for development. Generating electricity from gas requires less capital investment than alternatives and its flexibility makes it the natural complement to renewable power sources like solar and wind. For countries facing the challenges of an increasing population and rapid urbanisation, natural gas provides an intelligent, long-term approach to fuelling growth in an environmentally sustainable way.

Gas is also increasingly used in the transportation sector, where it offers a lower emission and low cost alternative to oil fuels. Innovations in use, such as combined heat and power and combined cooling, heat and power also offer ways to use gas even

more efficiently, with further environmental and economic benefits. With these advantages, natural gas is expected to play a far bigger role in meeting the global energy challenge than had previously been assumed.

On the supply side, there is no shortage of gas. Gas is diverse, secure and abundant. There is currently an estimated 250 years of global supply identified, with much more newly emerging exploration potential, especially in shale gas. The gas industry in the past decade has also developed the technology needed to unlock resources previously assumed to be out of reach or uneconomic to develop.

Indeed, never has natural gas had so much potential to play in solving the energy needs of the world. The “natural gas revolution” is the most significant energy development in decades.

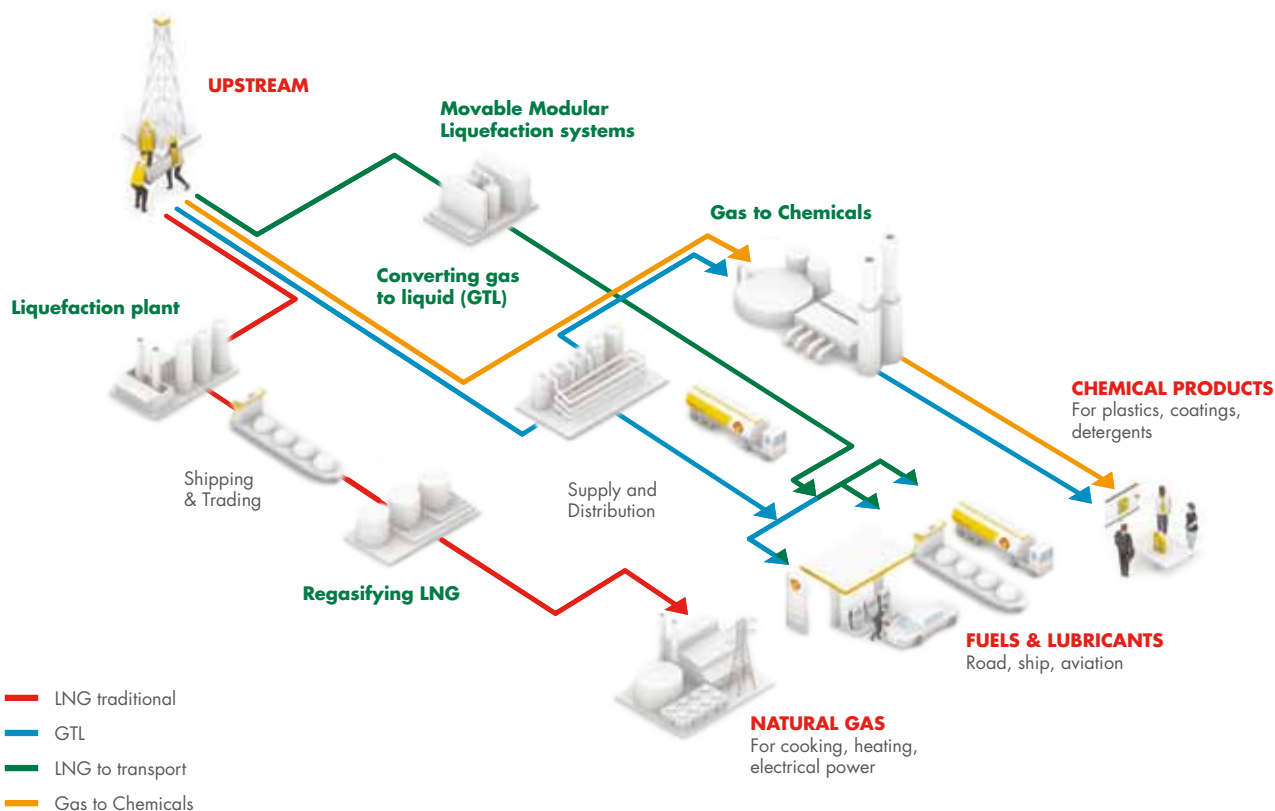
Shell and Natural Gas

Shell is the leading international oil company in the liquefied natural gas (LNG) industry, with around 22 mpta of LNG production on-stream today – a market share of about 7% – and a number of



Pearl GTL, Qatar.

SHELL GAS VALUE CHAINS



projects currently under construction that will add another 7 mtpa to its portfolio. In addition, Shell is maturing over 20 mtpa of LNG options in Australia, Indonesia and North America.

For the longer term, Shell has gas-focused exploration programmes in many locations which have large scale resource potential such as China, South Africa and Ukraine.

In short, the gas business is a fundamental one for Shell, which has developed a globally integrated gas portfolio along the whole value chain – covering exploration, production, liquefaction, transportation, and downstream applications. Shell's integrated gas earnings have more than trebled in the last five years, mainly driven by LNG and gas-to-liquids (GTL) production. Shell, the industry leader in both LNG and GTL, continues to develop innovative new integrated gas applications, such as gas-to-chemicals (the conversion of ethane into commercial petrochemicals), and LNG for transport.

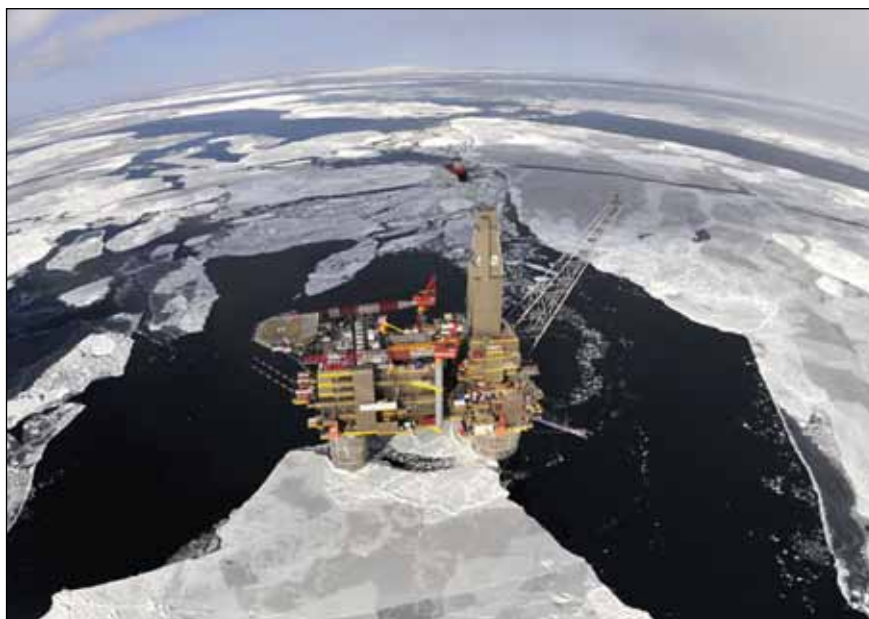
Shell believes that taking a full value chain approach to its gas portfolio provides

distinct advantages, extending its global reach from the supply chain to the customer base, and bringing unrivalled economies of scale advantages through this integration.

These fundamentals give Shell the confidence to consider potential investments of over \$20 billion in the gas business over the period 2012-2015, which

will add over 30% to its existing LNG capacity, to reach around 29 mtpa by 2017.

In short, Shell believes in the importance and the potential of gas, and is investing significantly in the resources, the technology and the markets to ensure that we continue to play a leading role in its exciting future.



Natural gas for the Sakhalin II LNG plant is produced in subarctic conditions.



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Features

This issue's features section starts with a focus on LNG to mark the 17th Conference and Exhibition on LNG of which IGU is one of the sponsoring organisations. We have a round-up of major liquefaction and regasification developments around the world and also look at LNG as a transportation fuel.

Then we have articles on the last UN Climate Change Conference – COP 18 – and IGU's side event there, and on developments in pipeline inspection and integrity management, while IGU's Charter Member from the Slovak Republic reports on a special event to mark the country's transmission anniversaries. These are followed by a case study from Task Force 1 – Human Capital on addressing skills shortages, contributions from IGU's new Wise Person, Nobou Tanaka, and two of the Regional Coordinators, Kang Soo Choo and Gertjan Lankhorst, a profile on the new Director of the IGU Secretariat, Carolin Oebel, a report on the recent IGU symposium in Oslo and a report from Hanne Thomsen, one of the originators of the Gas Historical Network.

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



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New Growth Phase for LNG Business

By Mark Blacklock

A record 5,000 delegates are expected to gather in Houston for LNG 17 making it the biggest gas event of 2013 and reflecting the growing importance of the LNG business.

According to IGU's World LNG Report, global LNG trade increased 8% in 2011 to reach a new high of 241.5 million tonnes. Provisional figures for 2012 show a slight drop but growth is set to resume and the medium-term forecasts are good.

The LNG business is evolving as it grows and developments throughout the LNG chain will be covered in a conference programme which has expanded by 40%. In particular, there are dramatic changes underway in the line-up of exporters.

The world's top LNG exporter, Qatar will take second place to Australia by the end of the decade and the USA could become number three a few years later, while Canada and countries bordering the Eastern Mediterranean and in East Africa are working on a range of LNG proposals.

Although the USA started LNG exports from Kenai in Alaska in 1969, it is a net importer. Indeed, when the American Gas Association was pitching to host LNG 17, imports were forecast to increase significantly to make up for declining supplies of domestic gas. The unconventional gas revolution has completely reversed the situation and the USA is set to become a net exporter in 2016 when the first phase of the Sabine Pass liquefaction project ramps up to full production. A further 150 mtpa of liquefaction capacity has been proposed and, while many proposals will fall by the wayside, it is clear that the USA will become an important export player.

Later this year Angola will join the ranks of LNG exporters, bringing the total to 18. Algeria will also bring new capacity online in 2013 and global liquefaction capacity will reach 296.75 mtpa. There are 26 importers with a total regasification capacity of 608 mtpa, while Indonesia has a regasification terminal which is currently used for domestic cargoes. The global fleet of LNG carriers stands at around 360 vessels.

The major markets for LNG will continue to be in Asia-Pacific where the existing six importers led by Japan have burgeoning requirements and another six countries are building or evaluating import terminals. New supplies should help reduce the Asia-Pacific price premium and stimulate the market.

Liquefaction developments

Africa

Angola LNG's start-up was postponed throughout 2012 and at the end of the year the country's Minister of Petroleum, José Botelho de Vasconcelos said that LNG exports would begin in the first quarter of 2013. At press time, it looked as if that would slip to the second quarter. The project has a capacity of 5.2 mtpa and its primary source of supply is gas associated with crude oil production that was previously flared. The Angola LNG project partners – Chevron, Sonangol, Total, BP and Eni – are all members of the World Bank-led Global Gas Flaring Reduction (GGFR) partnership.

Cameroon is also a GGFR partner and national oil company SNH has teamed up with GDF Suez to evaluate an LNG project using gas that would otherwise have been flared. An upstream gas gathering system would supply



◀ A gas flow test in Mozambique's Offshore Area 1.

gas to a liquefaction plant with an initial 3.5 mtpa train on the coast at Mboro near Kribi.

In Nigeria, a final investment decision (FID) is still awaited for Brass LNG, the partners (Nigerian National Petroleum Corporation, Eni, ConocoPhillips and Total) having originally signed the heads of agreement in 2003. The project calls for two 5 mtpa trains to be built on Brass Island in the Central Niger Delta. ConocoPhillips has decided to withdraw from Nigeria and in December 2012 agreed to sell its stake to Oando. This deal is expected to close in mid-2013.

Meanwhile, Algeria, the world's first commercial LNG exporter back in 1964, will inaugurate the 4.5 mtpa GL1K plant at Skikda in April. It is operated by Sonatrach which says the 4.7 mtpa GL3Z plant in Arzew is due to start up in November.

There is a new focus on projects in East Africa where some 2.8 tcm of gas has been discovered offshore Mozambique and Tanzania in the Rovuma Basin. Mozambique is targeting 2018 to start LNG exports, while Tanzania's plans are longer term.

Mozambique LNG was set up by ENH (the country's NOC), Anadarko (operator), Mitsui of

Japan, Bharat PetroResources and Videocon of India and PTT of Thailand. They have the licence for Mozambique's Offshore Area 1 and the plan was to draw gas from two important discoveries, the Prosperidade field and the Golfinho/Atum complex, to feed a liquefaction plant with an initial two 5 mtpa trains in Palma. In December 2012, Anadarko announced a heads of agreement with Eni, the operator of Offshore Area 4 to join forces in developing Mozambique's LNG project. The Palma site has room for up to 10 trains with a total capacity of 50 mtpa.

No details of a new shareholding structure for Mozambique LNG were available at press time (Eni's partners in Area 4 are ENH, Galp-Energia and Kogas) but they may be announced during LNG 17. FID is slated for late 2013.

Asia-Pacific

The boom in Australia's natural resources sector has boosted the Australian dollar and increased demand for supplies and skilled staff, in turn pushing up project development costs. Gorgon LNG, for example, announced in late 2012 that its budget had increased to \$52 billion from the original \$37 billion, with the date of the first cargo slipping to the first quarter of 2015.



▲ Gorgon LNG's liquefaction plant is being built on Barrow Island. INSET Inside one of the plant's LNG storage tanks.

The cost pressures have led to the postponement of FID on a number of projects, but those already underway will add 61.2 mtpa of capacity to the existing 24.1 mtpa and make Australia the world's top exporter of LNG by the end of the decade. The projects include the first use of unconventional gas as an LNG feedstock, carbon capture and storage (CCS) and a floating liquefaction plant.

Australia has large reserves of coal-bed methane (CBM – known in Australia as coal-seam gas) and is the third producer after the US and Canada. It will become number two when three CBM to LNG projects come onstream with a total capacity of 25.3 mtpa.

CNOOC has reached agreement with BG Group to up its stake in Queensland Curtis LNG's Train 1 from 10% to 50% and the deal is expected to close by mid-2013. The project is on schedule to start production from Train 1 in 2014 followed by Train 2 in 2015. BG's partner for Train 2 is Tokyo Gas which has a 2.5% stake.

Australia Pacific LNG (partners Origin Energy, ConocoPhillips and Sinopec) and Gladstone LNG (partners Santos, Petronas, Total and Kogas) aim to start production from their first trains in 2015 followed by their second trains in 2016.

CCS is an integral part of the Gorgon project and the liquefaction plant will be the second

(after Snøhvit in Norway) to have this facility. Gorgon's partners are Chevron (operator), ExxonMobil, Shell, Osaka Gas, Tokyo Gas and Chubu Electric Power, who have teamed up to develop the Greater Gorgon Area gas fields, located 130km off the north-west coast of Western Australia. The liquefaction plant with three 5.2 mtpa trains is being built on Barrow Island and when all trains are in operation Gorgon will be injecting 3.6 mt of CO₂ a year into a saline aquifer.

Chevron is also the operator of Wheatstone LNG whose other partners are Apache, PE Wheatstone (a Japanese consortium of Mitsubishi, Nippon Yusen, TEPCO and JOGMEC), Kuwait Foreign Petroleum Exploration Company, Shell and Kyushu Electric. The liquefaction plant will be located at Onslow in Western Australia with an initial two trains fed by gas from the Wheatstone and Iago fields and a capacity of 8.9 mtpa. The project is scheduled to enter service in 2016.

The floating LNG (FLNG) project will be located above the Prelude field, some 200km offshore north-western Australia. Due to start production in 2017, it is being developed by Shell and will have an LNG capacity of 3.6 mtpa in addition to condensate and LPG production. Inpex and Kogas joined Shell as partners in 2012 and CPC has signed an agreement to take a stake. Samsung Heavy Industries and Technip have the engineering, procurement and construction (EPC) contract.

Also scheduled for 2017 start-up is Ichthys LNG, which will produce 8.4 mtpa of LNG in addition to LPG and condensate from the Ichthys field in the Browse Basin. The two-train processing facility will be built at Blaydin Point near Darwin and the partners are Inpex, Total, Tokyo Gas, Osaka Gas and Toho Gas.

Three further Australian projects are awaiting FID: Arrow, Browse and Bonaparte.

Arrow is a joint venture CBM project of Shell and PetroChina for an initial two trains with a total capacity of 9.2 mtpa in the first phase and

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► Laying the pipeline which will supply CBM to the Queensland Curtis LNG plant on Curtis Island.

up to 18 mtpa ultimately. Start-up is envisaged in 2017.

The 12 mtpa Browse project has Woodside as operator and Shell, BP, Mitsubishi, Mitsui and BHP Billiton as partners. Feedstock from the Brecknock, Calliance and Torosa gas and condensate fields in the Browse Basin would be processed at a three-train plant at James Price Point 60km north of Broome. Again, start-up is envisaged in 2017.

Bonaparte is a joint venture of GDF Suez and Santos which covers the deployment of a floating, production, storage and offloading (FPSO) LNG facility in the Bonaparte Basin in the Timor Sea, 250km west of Darwin. The facility would be used to develop the Petrel, Tern and Frigate fields to produce 2 mtpa from 2018.

Elsewhere in Asia-Pacific, Papua New Guinea will become an LNG exporter in late 2014 with 6.9 mtpa of capacity, while Indonesia will add a 2 mtpa train in 2014. Both countries have projects awaiting FID.

The partners in the two-train PNG LNG project are ExxonMobil, Oil Search, National Petroleum Company of PNG, Santos, JX Nippon

Oil & Gas Exploration, Mineral Resources Development Company and Petromin, while Donggi-Sonoro LNG in Sulawesi, Indonesia is a joint venture of Mitsubishi, Kogas, Pertamina and Medco.

In Papua New Guinea, the government has reached agreement with InterOil to develop the Elk and Antelope fields to feed an initial 3.8 mtpa train under the Gulf LNG project. The government would like a major to be involved as well and negotiations with partners are continuing.

In Indonesia, a third train of 3.8 mtpa is proposed for Tangguh in 2018, while Inpex and partners Shell and PT Energi are working on a 2.5 mtpa floating LNG project to exploit the Abadi field.

Meanwhile, Malaysia is vying with Colombia to become the first country to inaugurate an FLNG facility. The Kanowit field, 180km offshore Bintulu, is set to come onstream in 2015. Petronas launched the 1.2 mtpa project at the 25th World Gas Conference in June 2012 in Kuala Lumpur, and awarded the EPC contract to Technip and Daewoo Shipbuilding & Marine Engineering. Petronas is carrying out front-end



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Panama Canal Expansion Boosts LNG Trade

The Panama Canal's expansion will have a major impact on the LNG trade by accommodating larger vessels and opening up a cost-effective route between the US export projects on the Gulf Coast and Asian markets. From 2015, all but the Q-flex and Q-max LNG carriers will be able to use it.

The \$5.25 billion expansion programme involves the construction of two new sets of locks, one on the Pacific and one on the Atlantic side of the Canal, the widening and deepening of existing navigational channels at the Pacific and Atlantic entrances and in Gatun Lake, the deepening of Culebra Cut and the construction of a new 6.1km-long access channel to connect the Pacific locks and the Culebra Cut. Gatun Lake's maximum operating level will also be increased to improve canal water supply and draft dependability.



The current locks can accept vessels up to 294.1m long and 33.2m wide with a draft of 12.04m. The new locks will accommodate vessels up to

366m long and 49m wide with a draft of 15.2m. They will be the canal's third set of locks and will increase overall capacity as well as handling larger vessels.

engineering and design (FEED) for a second FLNG project of 1.5 mtpa to be located offshore Sabah.

North America

The US authorities have received applications to build an astonishing total of 170 mtpa of liquefaction capacity, but only one new LNG project – Sabine Pass – has approval to export to countries with which the USA does not have a free trade agreement (FTA).

Cheniere Energy opened Sabine Pass in Louisiana as a regasification terminal in 2008. It is now adding liquefaction capacity and in the first phase two 4.5 mtpa trains are due to start up in the second half of 2015. Two more trains are projected for 2017 and 2018. Cheniere has also applied for permission to build a three-train plant with a total capacity of 13.5 mtpa near Corpus Christi in Texas. The

company received authority in 2005 for an import terminal but it was never built. Start-up is projected for late 2017.

Of the many other export projects the two closest to FID are Freeport LNG, which opened in 2008 as an import terminal and is considering adding three 4.4 mtpa trains, and Golden Pass. The latter opened in 2010 and is operated by ExxonMobil and Qatar Petroleum who are considering two 7.8 mtpa trains. Both projects envisage a 2017 start-up.

Meanwhile, the original US LNG plant at Kenai in Alaska, which started exports to Japan in 1969, resumed shipments in May 2012 after a temporary shutdown. It has been wholly owned by ConocoPhillips since the buyout of Marathon's share in 2011.

Canada's LNG export projects are centred on the coastal communities of Kitimat and

Prince Rupert in British Columbia, which offer good access for LNG tankers to supply markets in Asia. Three projects have received export licences and are awaiting FID: Kitimat, Canada and BC LNG.

Kitimat LNG is a joint venture of Apache, EOG Resources and Encana to build a plant with an initial 5 mtpa train using feed gas from Apache's and EOG Resource's shale plays in British Columbia and Alberta. Kitimat LNG's owners would separately develop the Pacific Trails Pipeline to transport the gas to their terminal. Start-up is projected in 2017.

Canada LNG is led by Shell with Mitsubishi, Kogas and PetroChina as partners. The plant would have an initial capacity of 12 mtpa with two trains and be supplied by a new pipeline from north-east British Columbia to be built by TransCanada Corp. The gas would come from the Horn River and Montney shale plays. Engineering work and environmental assessments are underway and start-up is envisaged in 2019 if a final go-ahead is given.

BC LNG Export Cooperative is a joint venture between the Haisla First Nation and LNG Partners for a floating liquefaction plant off the Haisla reserve. (First Nations is a term that collectively refers to various Aboriginal peoples in Canada who are neither Inuit nor Métis.) The capacity would be 700,000 tonnes initially rising to 1.8 mtpa and the plant would be supplied by the existing Pacific Northern Gas Pipeline. Start-up is currently given as 2015 but this seems optimistic given that a final go-ahead is still awaited.

There is also a project proposed for Canada's east coast which would target markets in Europe and India. Goldboro LNG is being promoted by Pieridae Energy and would have a capacity of 5 mtpa for a 2018 start-up. The site on the southeast coast of Nova Scotia is adjacent to the Maritimes & Northeast Pipeline.

South America

The honours for the first floating project could go to Colombia if its floating liquefaction, regasification and storage unit (FLRSU) enters service in late 2014. At 0.5 mtpa this is smaller than Kanowit in Malaysia (or Prelude in Australia), but it will be a landmark project for the country which recently rejoined IGU.

The feedstock gas will come from the onshore La Creciente field and be transported by pipeline for processing on the Caribbean coast at Tolú. Pacific Rubiales Energy is developing the project and will lease the FLRSU from Exmar.

Russia

Russia is keen to expand its LNG business to help diversify the country's customer base for gas exports. Currently, pipeline sales to Europe, the CIS and Turkey account for 92% of net exports; LNG sales to Asia from Sakhalin 2 make up 8%.

The original focus was on Shtokman but as its main market was to be the US this project has been put on hold. Two other projects are now nearing FID – Vladivostok LNG and Yamal LNG – while a third train for Sakhalin 2 is under evaluation.

Currently in FEED, Yamal LNG is a joint venture of Novatek and Total to produce up to 15.5 mtpa of LNG and 1 mtpa of condensate from the offshore South Tambeyskoye field. The feedstock gas would be piped to a new port



◀ Alexey Miller, Chairman of the Gazprom Management Committee (right) and Ichiro Takahara, Director General of Japan's Agency for Natural Resources and Energy signing a Memorandum on Vladivostok LNG during the APEC meeting in September 2012 with Russian President Vladimir Putin and Japanese Prime Minister Yoshihiko Noda as witnesses.

and three-train LNG plant at Sabetta in the Yamal Peninsula. The first train of 5 mtpa is slated for 2017 start-up with the other two by 2019. Yamal will require a fleet of ice-class LNG carriers to supply Asian markets for five months of the year via the Northern Sea Route, which can be used between July and November, and Atlantic Basin markets for the rest of the year.

Gazprom and a Japanese consortium led by Itochu are evaluating the Vladivostok LNG project which would have an initial capacity of 10 mtpa and a projected start-up in 2020. The gas would be brought from the Chayandinskoye field in East Siberia via a new 3,200km pipeline which Gazprom will complete by late 2017.

Eastern Mediterranean

Major gas discoveries have been made offshore Cyprus and Israel and the potential for neighbouring countries such as Lebanon is promising. Cyprus is studying the feasibility of an onshore LNG plant with an initial capacity of 5 mtpa, while Israel is looking at an FLNG option with a capacity of 3 mtpa.

Regasification developments

Eastern Mediterranean

Israel's existing gas supplies are near exhaustion. Pending the start-up of production from the discoveries – the Dalit, Leviathan and Tamar fields – and following the ending of pipeline imports from Egypt in April 2012, Israel started LNG imports in January. Israel Natural Gas Lines is leasing a floating storage and regasification unit (FSRU) from Excelebrate Energy. This is stationed offshore Hadera and has a capacity of 1.85 mtpa. Lebanon is also looking at LNG imports pending the development of its own resources.

Europe

Including Turkey, 10 countries in the region are currently importing LNG and a further seven have announced plans or proposals to build regasification terminals.

Lithuania currently imports all its gas via pipeline from Russia and wants to diversify its supplies. Klaipėdos Nafta is due to start LNG imports in 2014 through a 3 mtpa FSRU in Klaipėda. It will be leased from Höegh LNG.

Poland, Estonia and Ukraine also want to diversify supplies.

Polskie LNG, which is owned by the Polish transmission company Gaz-System, is being constructed at Swinoujście near Szczecin. It will have an initial capacity of 3.7 mtpa and is scheduled to open in 2014.

Estonia is evaluating various proposals including a regasification facility in Tallinn or being supplied via pipeline from a new terminal in southern Finland.

Ukraine is studying the feasibility of a 3.6 mtpa FSRU moored near Odessa.

Croatia, Malta and Romania are also considering LNG imports.

Asia-Pacific

Malaysia's LNG regasification terminal in Melaka was officially inaugurated during the opening ceremony of the 25th World Gas Conference but commercial operations have been delayed until the second quarter of 2013.

Indonesia already has the Nusantara FSRU for domestic LNG supplies and is set to start imports in 2014. The country's oldest LNG liquefaction plant, Arun, which is owned by Pertamina, ExxonMobil and a Japanese consortium, is running out of feedstock gas. Pertamina is converting it into a 3 mtpa regasification terminal for 2014. Also set to start up in 2014 are Pertamina's 3 mtpa FSRU in Semarang, Central Java and Perusahaan Gas Negara's 1.5 mtpa FSRU offshore Labuhan Maringgai in Lampung Province. The latter was originally planned for North Sumatra. It will be leased from Höegh LNG.

At press time, Singapore was expecting a commissioning cargo for its 6 mtpa import terminal on Jurong Island, making it the seventh country in the region to become an LNG importer. The terminal is expected to start



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commercial operations in the second quarter of 2013 and will be used to trade in LNG as well as to provide for local consumption. Expansion to 9 mtpa is under evaluation.

In Vietnam, PetroVietnam Gas is developing two regasification terminals. The country is due to start LNG imports in late 2014 via the Thi Vai terminal in Ba Ria Vung Tau Province. This will have an initial capacity of 1 mtpa. A terminal at Son My in Binh Thuan Province with an initial capacity of 3 mtpa is expected to come into operation in 2018.

Bangladesh's plans to import LNG via an FSRU off Moheshkhali Island in the Bay of Bengal have slipped and the target date is now 2015.

In the Philippines, there are two projects for LNG terminals, each of 1 mtpa. Energy World Corporation has identified a site on Pagbilao Grande Island in Quezon Province, while Shell is looking at a site in Tabangao in Batangas Province.

Rest of the world

Many other countries around the world are evaluating the flexibility of LNG imports. In

Africa, they include Benin, Côte d'Ivoire, Kenya and South Africa; in the Americas and Caribbean, El Salvador, Jamaica and Uruguay; and in the Middle East, Bahrain, Fujairah in the UAE and Jordan.

Looking ahead

The LNG industry has come a long way since the first commercial shipments in 1964. By the time of LNG 18 in April 2016, LNG capacity will have increased to some 340 mtpa as new trains come on line and Arun is fully decommissioned (see box).

Given strong economic growth in the prime Asia-Pacific market coupled with the question mark over the future of nuclear power in Japan, growing demand in South America and the fact that in Europe, although economic troubles have impacted overall energy demand, the desire to diversify supplies is boosting LNG trade, the market prospects are excellent.

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

LNG Capacity Scheduled to Start Up by 2017

Country	Facility	Capacity (mtpa)	Country	Facility	Capacity (mtpa)
2014			USA	Sabine Pass Train 1	4.5
Australia	Queensland Curtis LNG Train 1	4.25	32.75		
Indonesia	Donggi-Sonoro LNG	2	2016		
Papua New Guinea	PNG LNG Train 1	3.3	Australia	Australia Pacific LNG Train 2	4.5
Papua New Guinea	PNG LNG Train 2	3.3	Australia	Gladstone LNG Train 2	3.9
12.85			Australia	Wheatstone LNG Train 1	4.45
2015			Australia	Wheatstone LNG Train 2	4.45
Australia	Australia Pacific LNG Train 1	4.5	USA	Sabine Pass Train 2	4.5
Australia	Gladstone LNG Train 1	3.9	21.8		
Australia	Gorgon LNG Train 1	5.2	2017		
Australia	Gorgon LNG Train 2	5.2	Australia	Ichthys Train 1	4.2
Australia	Gorgon LNG Train 3	5.2	Australia	Ichthys Train 2	4.2
Australia	Queensland Curtis LNG Train 2	4.25	Australia	Prelude	3.6
			12		

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 - Flexibility and Interface Management: LNG roll-over prevention, flexibility within the terminals and also with the Transmission System Operators.
- Elengy has also developed over the years innovative solutions for Asset Optimization, delivering maximum tailor-made service in combining berthing, storage and regasification facilities or offering cold/heat integration with neighbouring industries (i.a. CCGTs).

... with many key international references:

From Singapore to India, through Canada, Greece or Chile, Elengy has had many

experiences on international projects either as strategic partner, project developer, for technical cooperation or for training. It is now part of its priorities to be more present on the international scene for future or existing onshore and floating LNG terminal projects: Elengy can indeed propose specific/punctual or regular/routine advisory services, technical assistance, training or field supports during any phase of a terminalling project but can also be more than that: A PARTNER!

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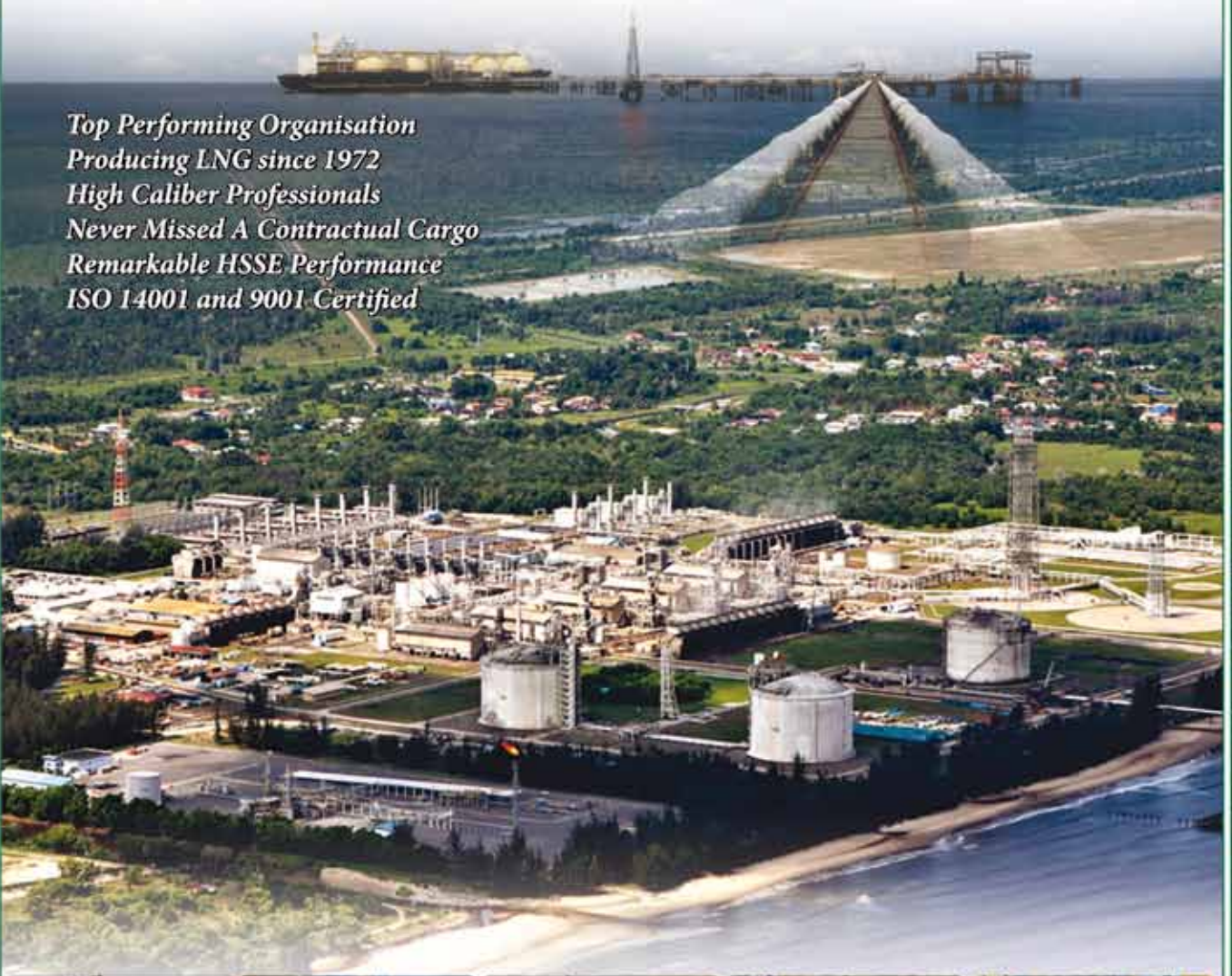
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LNG Breaks Through as a Transportation Fuel

While LNG boil-off has been used as a marine fuel since commercial trading started in 1964, and trials in the aviation and rail sectors date back to the 1980s, today's tougher emissions standards coupled with cheaper natural gas are driving LNG's breakthrough as a transportation fuel.

In this special feature Luis Benito of classification society Lloyd's Register looks at marine developments and Tom Campbell of research company Zeus Development reports on road trucking. We first give a short briefing on the aviation and rail sectors.

LNG Aviation Fuel

The Soviet Union had an alternative fuel programme in the late 1980s and early 1990s. This involved a Tupolev Tu-154B airliner with one of its three engines running on first liquid hydrogen and then LNG fed from a tank in the rear of the cabin. The converted aircraft was called the Tu-155 and made its first flight using liquid hydrogen in April 1988. The first flight using LNG followed in January 1989. The aircraft made a visit to Nice for LNG 9 later that year and to Berlin for the 18th World Gas Conference in 1991 before being retired.

In the US, LNG is one of several alternative aviation fuels being evaluated in the National Aeronautics and Space Administration (NASA) Subsonic Ultra Green Aircraft Research (SUGAR) project. As part of the project, Boeing has developed the SUGAR Freeze concept for an LNG-fuelled airliner operating in the 2040-2050 timeframe.



The Tu-155 has been retired (TOP) but Boeing has a concept for an LNG-fuelled airliner (ABOVE).

LNG Rail Fuel

There is a long history of research into gas as fuel for railway locomotives in the US. A locomotive running on propane was built by the Plymouth Locomotive in 1936. LNG trials were launched in 1986, first by the Department of Energy in a bench test, and subsequently by different railway companies. BNSF, for example, used four LNG-fuelled locomotives for shunting operations in the Los Angeles area. Today, the high cost of diesel has brought a resurgence of interest in LNG.

Across the border, Canadian National (CN) Railway has converted two diesel locomotives to dual-fuel operation and is testing them between Edmonton, an important energy processing and pipeline hub, and the oil sands centre of Fort McMurray.

Meanwhile, Russian Railways is testing a prototype and plans a fleet of 40 LNG-fuelled locomotives by 2020, and Indian Railways is considering using LNG.



Canadian National Railway is trialling a dual-fuel LNG diesel set (two locomotives with a tender in-between).

LNG as a Marine Fuel

By Luis Benito



Luis Benito: LNG is one of the fuels of the future.

New emissions limits for marine engines are coming into force and ship operators can either fit “scrubbers” to clean exhaust gases or switch from heavy fuel oil to low-sulphur distillate fuel or cheaper LNG. However, rules and a bunkering infrastructure need to be in place to reap the benefits of LNG.

The prospects for the use of gas to power ships have really taken off. With the explosion in interest in gas as a clean-burning fossil fuel there have been huge implications for the shipping and offshore energy sectors. LNG is certainly one of the fuels of the future – and this is very exciting. The combination of emission regulations and energy prices are driving demand for change.

But gas as fuel for ships presents certain risks and hazards that need to be addressed. Operational reality requires that flexibility can

also be accommodated in the new rules that interface effectively with risk-based approaches to dealing with novel concepts.

Lloyd’s Register has been working to ensure that shipowners, ship designers, shipbuilders, equipment manufacturers and technology developers can meet safety and performance goals by developing an approach that involves both prescriptive (rule-based) and risk-based approaches for when there are no rules.

With novel concepts there will always be challenges to address: will it work; will it work safely? Shipowners, cargo owners, ports, regulators, banks and insurers are all asking these questions.

We looked at what’s novel in designing gas-fuelled ships and we developed rules that will now evolve as solutions based on a thorough evaluation of risk eventually can

► The first commercial LNG tankers, *Methane Princess* (pictured) and *Methane Progress*, which entered service in 1964, were designed with boilers which could run on a combination of methane and oil so that LNG boil-off could be used as fuel.



support rule-based solutions. This is an ongoing process of constant improvement following proven performance.

The new rules draw on Lloyds Register's industry experience as the market leader in the classification of LNG carriers and our rules for gas ships. Completed in July 2012, the new rules replace Lloyd's Register's provisional natural gas-as-fuel rules. They have been harmonised with the IMO International Code for the Construction and Equipment of Ships Carrying Liquefied Gases in Bulk (IGC Code) and the draft International Code of Safety for Gas-Fuelled Ships (IGF Code). They were developed using in-service experience and our work with industry on joint industry projects as well as the oversight of our technical committees. This experience helps develop new rules as new technologies are validated through our risk guidance and understanding of hazards combined with Lloyds Register's leading risk methodology using qualitative and quantitative risk assessments.

The technology risks can be addressed. The big question for shipowners is when, or if, to invest – they need to take a view on whether

gas prices will justify the investment and whether, for their operational requirements, gas will be available where and when they need it. Securing supplies of gas for a fixed-point trading ship like a small ferry is much easier right now than for deep-sea ships trading worldwide.

To date most LNG as fuel applications are in the smaller ferry and offshore vessel sectors concentrated in the Baltic and Norwegian shelf, with MRF's *Glutra* the first LNG-fuelled ferry to enter service in 2000. Here local drivers, including the Norwegian NO_x Fund, and ease of moving LNG by road support investment decisions and bunkering operations.

Pricing and availability

So far as the deep-sea trades are concerned, Lloyd's Register's recent study on LNG bunkering and newbuilding demand concluded that container ships and cruise ships will be the most likely to adopt gas as fuel technology – if the price is right and bunkers are available.

The study looked at the main deep-sea trade routes, the fuel consumption of vessels in the global fleet and the current and future location of bunkering hubs. The findings have been

New Emissions Standards for Marine Engines

The International Convention for the Prevention of Pollution from Ships (MARPOL) adopted by the International Maritime Organisation (IMO) has six Annexes. Annex VI covers air pollution and sets limits to control the emissions of sulphur oxides (SO_x), nitrogen oxides (NO_x) and particulate matter from ship exhausts. In designated emission control areas (ECAs) the limits are more stringent. ECAs cover the Baltic Sea, North Sea, North American coastal area and, from January 2014, the US Caribbean Sea area. Annex VI also prohibits

deliberate emissions of ozone depleting substances and regulates ship-board incineration and the emissions of volatile organic compounds from tankers.

A revised Annex VI entered force in 2010 to achieve a progressive reduction in pollution. The maximum sulphur content of fuel oil for ships operating in ECAs was reduced from 1.5% to 1% in July 2010 and the global cap from 4.5% to 3.5% in January 2012. The ECA cap will be further reduced to 0.1% in January 2015 and the global cap to 0.5 %

in January 2020, although the latter date could be deferred to January 2025.

As regards NO_x emissions, different levels (Tiers) of control apply based on the ship construction date, and within any particular Tier the actual limit value is determined from the engine's rated speed. Tier I covers marine diesel engines installed from January 2000 and Tier II those from January 2011. A more stringent Tier III will be introduced in January 2016 for new-builds operating in ECAs.



▲ *Argonon*, the first new LNG-fuelled tanker was delivered in December 2011.

turned into an interactive model on LNG bunker demand that can be used to understand the likely future trajectory of LNG availability and demand as a marine fuel for deep-sea ships.

Competitive pricing could see widespread adoption and investment in LNG fuel technology by stakeholders in the deep-sea trades, and the study aims to help clients draft plans for future emission compliance. Equally significantly, it will help to foster the future design and technology of propulsion systems in the global shipping industry.

Outside of the niche markets, the study finds that the establishment of LNG bunkering infrastructure capable of supporting most of the world's consumers will be highly sensitive to the price of LNG relative to alternative fuels.

"The obstacles to the adoption of LNG as a marine fuel are practical factors, but they are not technical. They are commercial," says Hector Sewell, the Head of Marine Business Development for Lloyd's Register. "Establishing safe, reliable global LNG bunkering capability is feasible. But it will require considerable investment and risk management, and it will have to cover significant operational costs to challenge existing fuel-oil delivery systems."

Latifat Ajala, Lloyd's Register's Senior Market Analyst, built a dynamic demand model for the study that was rigorously tested and validated with key stakeholders, including shipowners, ports and engine manufacturers.

"We developed a model based on LNG supply, trade routes, ship-type fuel consumption, port locations and bunkering demand, as well as shipowner and port surveys. We then applied three demand and price-driven scenarios," she explains. "What we found was that the likelihood of global LNG bunkering facilities being established will depend on high demand for LNG-fuel on deep-sea trades, which will be driven by the price of LNG relative to current and future alternatives."

The study's base-case scenario predicted that by 2025 there could be 653 deep-sea, LNG-fuelled ships in service, consuming 24 million tonnes of LNG annually. These ships are most likely to be container ships, cruise vessels or oil tankers.

When the study modelled relatively cheap LNG – for example, 25% lower than current market prices – the projected number of LNG-fuelled ships rose to approximately 1,960 units in 2025. If the cost of LNG increased 25% against current



◀ *Viking Grace* (seen nearing completion) is the first large LNG-fuelled passenger ship.

prices, the model found that hardly any new LNG-powered tonnage would hit the water.

“Excluding smaller ferries and local trades where there are local market, fiscal and regulatory drivers – such as in parts of the Baltic and Norwegian shelf – it was the container-ship and cruise-ship markets that were the most likely to adopt LNG,” says Ajala. “This is because of their relatively high energy requirements, the demands of customers in these two sectors, their regular trading patterns and the time those ships spend in emission-control areas.”

“The difficulty for those looking to make decisions is that forecasting energy prices has always been a dangerous business,” she points out. “For shipowners looking to make these decisions, flexibility may be the key. Choosing engines that can burn both gas and fuel oil, or that can be converted, may be one way to manage the regulatory and commercial issues involved with fuel choices.”

Case studies: *Argonon*, *Viking Grace* and Clean Sky design

Lloyd’s Register was right at the heart of two of the most significant gas as fuel newbuilding projects to date: the first LNG-fuelled tanker

newbuild and the largest gas-engined application, as well as helping develop a new bulk carrier design.

Argonon, a 6,100-dwt dual-fuelled chemical tanker, was built by the Sainy Marine Shipyard in China and fitted out by Shipyard Trico in The Netherlands. *Argonon* was delivered to *Argonon Shipping*, a subsidiary of *Deen Shipping*, in December 2011.

The dual-fuel system is designed to burn an 80/20 mixture of natural gas and diesel, reducing SO_x, NO_x and particulate-matter emissions, as well as reducing the greenhouse gas emissions from tank to flue. The LNG is stored in a transport tank located on deck, supplied by Cryonorm Projects, based near Amsterdam. *Argonon* has the capacity to transit from Rotterdam to Basle and back without bunkering.

“This has been a great project and it is a significant first,” says Piet Mast, Lloyd’s Register’s Marine Business Manager for Western Europe. “The nature of inland waterways traffic, which passes through or close to major population centres, makes LNG an attractive way to reduce harmful local emissions. We had to look carefully at the risks and worked closely with the owner and the regulators to ensure that they



▲ The Clean Sky bulk carrier design has a single LNG tank on the port side.

understood, and were comfortable with, the technical solutions that were developed.”

Along with Lloyd’s Register, the Dutch Shipping Inspectorate approved *Argonon’s* LNG system for operation in The Netherlands. The next step was to secure regulatory approvals from the Central Commission for Navigating on the Rhine and the ADN¹ Safety Committee, which opened the way for navigation beyond The Netherlands.

Viking Line’s decision to order a 56,000gt ice class passenger ferry, *Viking Grace*, was a real step up in scale for LNG-fuelled projects. There is nothing else either on the blocks or even ordered yet that comes close to the energy requirements of *Viking Grace*. Built by STX Turku to operate between Turku and Stockholm, the ship was delivered in January as Viking Line’s new flagship.

The ferry’s bunker tanks are located on the stern and propulsive power is from 4 x Wärtsilä 8L50DF engines in a gas-electric system that delivers 30,400 MW. The ship bunkers at the Stadsgården facility in the Port of Stockholm, and the LNG comes from the AGA LNG terminal in Nynäshamn.

1 ADN – The European Agreement concerning the International Carriage of Dangerous Goods by Inland Waterways, which was made under the auspices of the UN Economic Commission for Europe.

A new LNG-fuelled bulk carrier design, developed by COSCO Shipyard Group of China, Golden Union of Greece and Lloyd’s Register, was unveiled in December 2012. The Clean Sky design Kamsarmax² project moves industry far beyond the concept stage for gas-powered bulk carriers.

Lloyd’s Register has provided approval in principle for the new design incorporating an LNG-as-fuel system. COSCO, Golden Union and Lloyd’s Register started the project in June 2011 to investigate the potential to develop a commercially viable bulk carrier design based on an existing COSCO conventional design but employing gas-powered propulsion systems.

The Clean Sky design builds in flexibility by enabling owners to choose dual, or tri-fuel engines able to burn heavy fuel oil or diesel as well as LNG. Various containment systems and configurations were considered by the project team, but the final choice was for a single tank that sits aft on the port side.

“We have addressed the technology issues – the approval in principle that we issued only comes after exhaustive risk investigation into the gas containment, bunkering systems and performance assessment,” says Nick Brown, Lloyd’s Register’s Area General Manager and Marine Manager, Greater China.

To date, LNG-as-fuel research, technology development and newbuilding activities have focused on specific niche sectors such as ferries, offshore vessels and short sea, or inland, trades. This project paves the way for take-up in deep-sea bulk carrier trades – and for tankers. “The challenges are similar for tankers”, says Brown. “Clearly there are benefits with using clean gas technology. The key issues now are commercial.”

Luis Benito is Global Marine Marketing Manager at Lloyd’s Register (www.lr.org).

2 Kamsarmax refers to a type of ship suitable for berthing at the Port of Kamsar in Guinea, where the major loading terminal of bauxite is restricted to vessels no longer than 229 metres.

Høegh LNG

2012 was an extraordinary year for Høegh LNG. In addition to successfully fulfilling existing contracts for our fleet of LNG carriers and floating LNG import terminals (FSRUs), the company secured charters for three FSRUs – one with Perusahaan Gas Negara (PGN) in Indonesia, one with Klaipėdos Nafta in Lithuania and, more recently, the selection as preferred bidder by Colbún and AES Gener in Chile. These developments gave the company the confidence to order a fourth FSRU from Hyundai Heavy Industries in October. Once completed in 2015, Høegh LNG's new-building programme will result in the industry's most modern fleet of FSRUs.

While Høegh LNG will continue to focus most of its capital and resources in the regas segment, the company continues to seize opportunities in traditional LNG transportation. In 2012, the company exercised an option to purchase 50% of the STX Frontier, a 153,600m³ LNG



carrier, expanding its current fleet to six LNG carriers.

The company will continue to develop its floating liquefaction activity, and has now set up a wholly owned subsidiary called Høegh FLNG Ltd, which will continue the development of this very exciting segment of the LNG market.

The company has also had major success in raising new equity and debt to fund its new building programme, through a share issue, which raised \$208 million, as well as a bond issue, which raised \$130 million. The company also closed the financing for the FSRU project in Lithuania, raising \$250 million in new debt.

With so much exciting commercial activity in 2012, it is tempting to look ahead to the next big contract or newbuilding order. While the company will continue to pursue opportunities in all phases of the business, it is important to remember that contracts alone won't secure our long-term future. Indeed, as the company expands in the LNG value chain, our success will not be determined by the promise of new opportunities, but by how well we operate our fleet to the highest standards, and execute existing projects.

Sveinung J.S. Støhle
President and Chief Executive Officer
Høegh LNG



- Three Floating Storage and Regasification Unit's (FSRU's) on order from Hyundai Heavy Industries (HHI), for delivery 2014. Two of the units on long term contracts to Perusahaan Gas Negara, Indonesia and Klaipėdos Nafta, Lithuania
- Operation of a fleet of eight LNG Carriers, including two Shuttle and Regasification Vessel
- A highly skilled organization with a wide range of competence gained through LNG operation since 1973
- A fully integrated company including in-house fleet management



The Rise of LNG in Trucking

By Tom Campbell



▲ Tom Campbell: vast on-highway diesel market has elicited most attention.

Even the most hardened sceptics of LNG as a transportation fuel have had to take notice of the rising clamour of interest in the fuel in the trucking industry. As we learned at World LNG Fuels 2013, the rise of shale gas in North America and stringent emissions regulations around the world have combined to push the development of natural gas in various industries. Yet it is the vast on-highway diesel market that has elicited the most attention, if not the most success from stakeholders.

At roughly 36 billion gallons (136 billion litres) of annual consumption in the United States alone, the on-highway trucking market stands as one of the single largest targets for potential LNG suppliers. With fuel cost savings ranging from \$1-\$2 per diesel gallon equiva-

lent, and fewer issues with weight and range penalties than CNG, LNG makes a tempting case for some operators. Yet despite its potential, major roadblocks remain before LNG is in a position to truly challenge diesel in the trucking industry. At Zeus, we consistently hear from truckers frustrated by the prohibitive incremental cost of vehicles, limited refuelling options and various operational and other issues. When, and if, these issues are addressed will have important repercussions on the viability of LNG in the trucking sector going forward.

Current market status

With diesel prices for US truckers hovering at the \$4 per gallon (\$1.06/litre) mark, it comes as little surprise that motivated operators have

► FedEx Freight is testing two Kenworth T660 LNG-fuelled tractors which operate from its Dallas service centre.



expressed an interest in LNG. Current retail fuelling prices can offer savings of approximately 25% or more. Though the additional cost and hassle factor of LNG may make this an unviable proposition for some, for those in a position to do so, LNG fuel has received an enthusiastic response. This should come as little surprise. Class 8 trucks (those defined as having gross vehicle weights over 33,000 pounds [15 tonnes]) on average have a fuel economy of slightly over 5 miles per gallon (2km/litre), and travel on average near 50,000 miles (80,000km) per year or more.

Despite the potentially lucrative nature of this market, many have been surprised by the relatively slow uptake of LNG-fuelled trucks in North America. Of the nearly 3 million Class 8 trucks operating in the United States and Canada currently, fewer than 5,000 are LNG-fuelled vehicles.

Fault for this slow uptake is traditionally blamed on a combination of a lack of infrastructure, limited engine and model choices, operational challenges and the high incremen-

tal cost of vehicles. Advances in the market, however, have begun to answer some of these challenges. Energy producers and entrepreneurial ventures like ConocoPhillips, Shell, Encana, Applied LNG, Clean Energy Fuels and others have all announced plans to begin developing or expanding liquefaction facilities in recent months. These developments have coincided and at times joined with build-outs of regional and national fuelling station networks.

Engine and truck manufacturers have similarly announced new engines to fill gaps in available horsepower, as well as new models to take advantage of these engines. In particular, the release of Cummins Westport's ISX 12G engine is seen as a key to answering the void between the joint venture's current 8.9 litre engine, and Westport's own 15 litre engine. The growing presence in the market of large, well-respected current diesel providers like Shell is also helping to convince truckers to trust that LNG is not simply a fad but rather a legitimate new trend. These firms also have the expertise and experience in conventional fuel logistics to



◀ Vos Logistics uses 14 LNG-fuelled Mercedes-Benz Econic trucks for distribution in The Netherlands, Belgium and western Germany.



▲ US bus operators were early adopters of LNG fuel. Santa Monica's Big Blue Bus Line operates a fleet of more than 200 LNG (pictured), CNG and electric/gas hybrid buses in the Los Angeles metropolitan area.

provide fuel to a broader range of customers beyond those using traditional open-access public truck stops. Their sustained investments in LNG have also helped to reassure some sceptics of their commitment to this new market.

Although attention has been focused on the North American market which enjoys low gas prices thanks to the shale revolution, LNG fuel is also making inroads elsewhere. Uptake in markets with a smaller beneficial price differential compared to diesel is being driven just as much by emissions concerns and government intervention. In the European trucking sector, for example, stringent EU emissions standards have pushed more and more operators to pursue the LNG option. Meanwhile, in Russia, firms led by Gazprom are working to create new markets for Russian gas including transportation.

It is China's efforts, however, that dwarf those of most other countries. Boasting over 8,000 LNG-fuelled trucks and buses with many more on order, no other country has pursued LNG across transportation modes as heavily as China. Much of this stems from centrally-created regulations in the 12th Five Year Plan and other policies pushing truck, bus, ship and other operators to use LNG. This rapidly expanding fleet is matched with rampant small-

scale liquefaction plant development nationwide, and a small but growing network of fuelling facilities.

The root of this unprecedented uptake comes from a simultaneous urge to find solutions to the major air pollution problems in urban areas, as well as a desire to find ways to use the country's own shale gas reserves as they become economically viable. Though an uplifting story for LNG fuel advocates, it remains to be seen if LNG is a viable diesel alternative without such heavy-handed support.

Early technology adopters

The roots of the on-highway LNG fuel industry in North America lie in two particular functions. The most notable early adopters of the technology were refuse fleets and bus fleets, a trend which has generally been the norm in regions developing LNG fuel. The majority of these fleets developed in cities in the American West, and primarily in southern California. Far from being an accident of fate, this trend was driven thanks in large part to efforts by the South Coast Air Quality Management District, which supported, and continues to support the fuel as a tool to combat air pollution. However, cities such as Dallas, Phoenix and others were also some of the early adopters of the fuel in their bus and refuse fleets, despite less supportive environmental regimes.

As the price of natural gas at the time was not as advantageous as today, the growth of these fleets was propelled more from an emissions standpoint than fuel economics. Concerns about smog reduction in urban and residential areas pushed numerous cities and refuse haulers to adopt LNG-fuelled vehicles, helped in part by generous grants. The quieter operation of these vehicles was a further boon for these fleets. Their operation profile, and return-to-base routing, were key factors in allowing these fleets to utilise LNG, helping cities and companies to avoid the expenses and challenges of multiple fuelling facilities.

New markets

With the fall of natural gas prices and growing technological maturity, LNG has begun to make inroads in new trucking applications. While CNG has largely supplanted LNG as the fuel of choice in early adoption markets like refuse fleets, LNG has come to be the preferred choice for larger trucks with higher fuel consumptions. These include fleets hauling heavy loads, those operating on long-haul profiles, and those operating over rugged terrain such as the Canadian Rockies. It is on these applications that fuel consumption is high enough and paybacks quick enough to warrant the additional capital cost of LNG-fuelled units. Their heavy fuel demand coupled with the fact that their operational profile means they may not return to a single base nightly also makes CNG a less promising option for these vehicles. While CNG is a useful option for return-to-base vehicles due to their ability to use “slow-fill” fuelling technology, for those travelling farther afield LNG is often a more promising option. Thanks to these constraints, two markets in particular have seen higher rates of adoption than most others.

The oilfield services sector, and in particular water haulers, is one market that has seen a surge of interest in LNG. These trucks haul heavy loads, and require large engines with high fuel consumptions. Quite simply, CNG may not be an option for many of these trucks because of a lack of sufficient on-board fuel storage. These fleets may also receive additional support from their energy and production firm clients, who are eager to support increased use of natural gas in the transportation fuel mix. It should come as no surprise then that some of the largest recent purchases of trucks using LNG have come from this area, led by firms like Heckmann Corporation and Green Energy Oilfield Services.

Trucks engaged in long-distance line hauling have also been a new market where LNG continues to enjoy success. Though more



localised fleets have, and will continue to push for CNG, those travelling greater distances or with heavier loads continue to see the value of LNG. Included among these fleets are UPS in the US South-west and Alberta’s Bison Transport. These fleets either haul loads for customers beyond easy local range, or are engaged in heavy hauling that may require larger engines. As a well-rounded fuelling station network continues to evolve throughout the United States and Canada, LNG fuel advocates hope the success of these operators means LNG will become increasingly viable for trucks with similar operating profiles.

Developing fuelling facilities

Underpinning the rise of LNG as a trucking fuel has been the development of national, and local, fuelling station networks. While the efforts of major firms like Clean Energy Fuels and Shell have justly earned the most attention and praise, equally important has been the entry of smaller fuelling station chains into the mix. That all sizes of firms have realised the value of offering LNG to their customers is a positive sign of the health and growing reality of LNG as a viable transportation fuel.

▲ SITA UK operates this refuse truck running on bio-LNG produced at its Albury landfill site in Surrey.



▲ UPS is using LNG to fuel its long-distance line hauling fleet in the US South-west.

Clean Energy Fuels' "America's Natural Gas Highway" programme and Shell's "Green Corridors" have been the most heralded LNG fuel projects in North America. Both projects are similar in their particulars, with each being linked to an existing nationwide fuelling station chain; Pilot Flying J for Clean Energy, and TravelCenters of America in the US and Pilot Flying J in Canada for Shell. The ultimate goal of the programmes is to create cross-country fuelling corridors, enabling line-haul trucking operators to feel comfortable using LNG. To supply these stations, both companies have, or plan to develop their own liquefaction capacities. While Clean Energy Fuels will use its plants in Boron, California, Willis, Texas and two new General Electric Micro LNG plants at undecided locations to supply some stations, Shell will utilise its Jumping Pound facility in Alberta. However, practical limits to trucking LNG suggest that both companies will either need to develop further capacity, or rely on third-party providers.

Amidst the news of national truck fuelling networks, several other providers have entered the space. These range from respected national fuel providers, like Gulf Oil and Kwik Trip, to existing energy providers like Gaz Metro, to entrepreneurial startups like Blu Stations. Each

has worked to provide its own, smaller network of fuelling facilities, in New England, the American Mid-west, and Utah. These have been joined by a diverse collection of companies including Irving Oil, FortisBC, Encana and others. That such a large number of firms from an extremely broad swath of backgrounds and locations are working to enter this market is a strong indication of the potential seen in the market. In addition, with so few possessing their own liquefaction capacity on which to rely, increasing numbers of station will drive further demand for new liquefaction projects throughout North America.

Challenges ahead

Despite coming resolutions to issues with fuelling stations availability and growing technological options, LNG fuel has several difficult obstacles to surmount before it can achieve wide-spread adoption. The most widely noted lies in the high incremental cost of LNG-fuelled units. While the extra cost depends in large part upon engine type and the amount of on-board fuel storage, operators can pay between \$30,000 and \$70,000 on top of the base cost of a truck. With additional fuel tanks on larger vehicles, this can even reach up to \$100,000. The majority of this cost stems from the high cost of cryogenic fuel tanks, thanks to a small list of potential suppliers and their relative difficulty to produce. Help may be on the horizon for some purchasers however. Growing interest in the market has led to more and more firms entering the fray, including new firms and experienced cryogenic container manufacturers. Optimistically, the growth in options may help to drive down the cost of these and other components, making LNG a more viable option.

Unfortunately, operational challenges and quirks of the trucking market will pose thornier issues for LNG fuel. Thanks in large part to the current global financial climate, a high number of operators are choosing to hold on to existing



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**We look forward to seeing you
at LNG 17 in Texas in 2013!**



▲ The Clean Energy Fuels public CNG/LNG fuelling station in Long Beach, California. A well-rounded fuelling station network is evolving throughout the US and Canada.

units and pay for upgrades rather than purchase any new units, let alone dramatically more expensive LNG-fuelled ones. Even those that can afford the jump to LNG face issues in tailoring their operations to available fuel facilities. A large number of operators may not refuel at public filling stations, forcing them to find workarounds such as expensive mobile fuelling units. Regulatory issues also represent a problem for LNG in particular, as regulations on excise taxes and weight allowances punish LNG unfairly due to its lower Btu content and heavy cryogenic fuel tanks. Finally, a lack of integrated and normalised training regimes has yet to be developed, forcing many prospective operators to largely fend for themselves as they learn to use new trucks and upgrade their maintenance facilities.

The road ahead

Despite the increasing frequency of forecasts foretelling the imminent doom of diesel and the rise of natural gas in trucking, LNG and CNG still have a long way to travel before they can

displace conventional fuels. While issues with fuelling and technology availability are being tackled, other challenges like the high cost of vehicles, training, regulations and various other problems remain. Here at Zeus, however, we believe operators, suppliers and producers of LNG should remain optimistic. With low gas prices and high oil prices set to stay in North America for years to come, the ultimate drivers behind the technology will remain sound. Amidst this, the emergence of more technology options as well as the expertise to use them mean LNG as a fuel in trucking is poised to grow more and more in the US fuel mix. Ultimately, it will be up to truckers themselves to put their foot on the gas and get this trend moving.

Tom Campbell is the LNG fuel analyst at Zeus Development Corporation (www.zeusintel.com), a research company that offers consulting and market intelligence in four areas: international LNG trade, LNG fuels, upstream gas and gasification. Zeus also organises the World LNG Fuels conference.

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COP 18 Delegates Agree Doha Climate Gateway

By Georgia Lewis

The annual UN Climate Change Conferences are known as Conferences of the Parties (COPs) to the UN Framework Convention on Climate Change (UNFCCC). COP 18 was held in Doha, Qatar, November 26 – December 7, 2012.

The 2012 conference was a more subdued affair than in previous years but it culminated in the announcement of the Doha Climate Gateway. The agreement, which finally came about after frantic negotiations as the deadline drew closer, includes two important elements in relation to the Kyoto Protocol and negotiations for the 2015 global climate change agreement.

The Kyoto Protocol was amended to extend into a second commitment period starting from January 1, 2013. This will run until 2020, the year when the legally binding agreement being negotiated under the Durban Platform (negotiated at COP 17 which was held in Durban in 2011) will come into force. However, the countries that have signed up to these targets only account for 14% of international emissions. The countries that are taking on the further commitments under the Kyoto Protocol have agreed to review their emission reduction commitments by 2014 at the latest, with a view to becoming more ambitious in this regard.

An agreed timetable to negotiate the 2015 global climate change agreement has been set. This will involve meetings and workshops to be held throughout 2013 to prepare the new agreement and explore more ways to raise ambition. To prevent a repeat of past COP experiences with onerous delays, it was agreed that elements of a negotiating text should be available no later than the end of 2014 so that a draft negotiating text is available before May 2015, well in advance of COP 21.

Particularly relevant to the gas industry were agreements reached over developing and financing green technology. These include the Green Climate Fund, which is due to launch activities in 2014, while a consortium led by the UN Environment Programme (UNEP) was confirmed as host of the Climate Technology Centre for an initial term of five years.

Ensuring that natural gas is part of a responsible climate change mitigation solution in relation to access to energy for all was one of the topics of IGU's side event at COP 18 on November 30 (see *the following article*).

Developed countries reiterated their support for developing countries at COP 18 with a view to mobilising \$100 billion for adaptation and climate change mitigation by 2020. The Doha agreement also encourages developed countries to boost their financial contributions between 2013 and 2015 so there is no gap in continued financial support.

Another measure agreed at Doha included a review of the long-term temperature goal, starting in 2013 and concluding in 2015.

Global Business Day

On December 3, the Doha Global Business Day was held under the theme of "Diversifying Actions for Climate Impact". It was organised by the World Business Council for Sustainable Development (WBCSD) and the International Chamber of Commerce. The discussions at this meeting were also relevant to the natural gas industry, with Peter Bakker, President of WBCSD, underscoring the importance of scaling up climate policies in his opening address. Mr Bakker challenged business across the world to work towards longer-term low-carbon strategies – again, this is

an area where natural gas can play a substantial role as a cleaner burning fuel than oil or coal.

John Kilani, Director of Sustainable Development Mechanisms for the UNFCCC, highlighted the need for business community involvement for the real world success of bottom-up and top-down approaches to climate change mitigation, while Phillippe Joubert, Senior Advisor, WBCSD, referred to the report by the Global Electricity Initiative, which was launched by 25 electricity utilities at COP 17. The report highlights the public demand for lower-carbon energy and more affordable energy, two issues which the global gas industry is well-placed to address.

Carbon capture and storage (CCS), another major topic at the IGU side event, was also discussed at the Doha Global Business Day.

David Hone, Climate Change Advisor, Shell said he was concerned that CCS is “not coming out of the starting gate fast enough” and highlighted the role of carbon pricing in changing business behaviour and achieving climate change objectives.

Giles Dickson, Vice President, Environmental Policies and Global Advocacy, Alstom, said energy products should be “clean, reliable and affordable” and the challenge is marrying these three attributes. He highlighted the role of CCS and added that reducing the cost of CCS by 2030 is “achievable” with government support for pilot programmes, large-scale demonstration facilities, and feed-in tariffs.

Vital forum

The Doha agreement was described by Connie Hedegaard, European Commissioner for Climate Action, as having “crossed a bridge” between the past agreements and the ambition of 2015. However, there is much to be done before a new, legally binding agreement is finalised. Negotiations will continue at COP 19 in Warsaw this November.

“The outcome of the COP 18 negotiations shows that the world needs realistic and balanced approaches to the global energy challenges as energy issues are of strategic importance to all nations,” said Torstein Indrebø, IGU Secretary General. “Reduction of emissions is urgent, but we also need competitive energy that can support economic growth and job creation for the millions who are unemployed, and we must take steps to mitigate energy poverty for the more than a billion people that lack access to modern energy services. I appreciate the fact that natural gas is increasingly appreciated as a cost-effective way to provide good energy solutions for the world.”

In this context, IGU recognises the UN Secretary General’s initiative “Sustainable Energy for All” as very appropriate because it sets clear goals addressing the issues from a wider perspective.

“IGU has presented our recommendations in the *Global Vision for Gas* report which was discussed at the IGU side event. It is encouraging to note that our conclusions were shared by many organisations in Doha. These include a focus on energy savings and efficiency, increased use of gas in the power sector, and in parallel a phase-in of renewable energy. CCS will come later when operational and commercially available,” said Mr Indrebø.

Georgia Lewis is the Deputy Editor of International Systems and Communications.

▼ UNFCCC Executive Secretary Christiana Figueres with UN Secretary General Ban Ki-moon at COP 18.



Liquefied natural gas: a major area of development

Combining energy efficiency with flexibility of transport, liquefied natural gas (LNG) has an assured future and its development will be vital to meeting growing energy requirements. Total is among the global leaders in LNG and has identified it as a key element in its development strategy. Philippe Sauquet, Total's President Gas & Power, explains its importance, as illustrated by our projects in Australia where we are strengthening our presence.

Liquefied natural gas, an energy of the future

Demand for gas has been increasing for 30 years and this rise is set to continue: Total believes that gas will become the second most important fossil fuel by 2030, ahead of coal. LNG has gained ground in the last two decades as an increasingly important component in the global balance of gas and, by 2020, it is expected to account for 14% of the world's gas supply. The segment's growth is driven by the numerous



Philippe Sauquet, Total's President Gas & Power.

advantages offered by LNG, such as energy efficiency and flexibility of transport. The liquefaction of gas makes its transport over long distances possible and economical. This opens up sales outlets for large reserves that lie far away from major

consumer areas. In addition, as LNG is transported by boat, a shipment can be redirected after signing a contract – even when en route – providing great flexibility and the possibility of selling it at the best price. But LNG also demands real know-how as it involves complex large-scale, long-term projects. It requires substantial investment capacities and appropriate technical, legal and marketing expertise. These are all Total's strengths: as an oil major, we are experts in the management of major projects and our technical skills are highly developed strengths: as an oil major, we are experts in the management because we have been active in LNG from the outset.

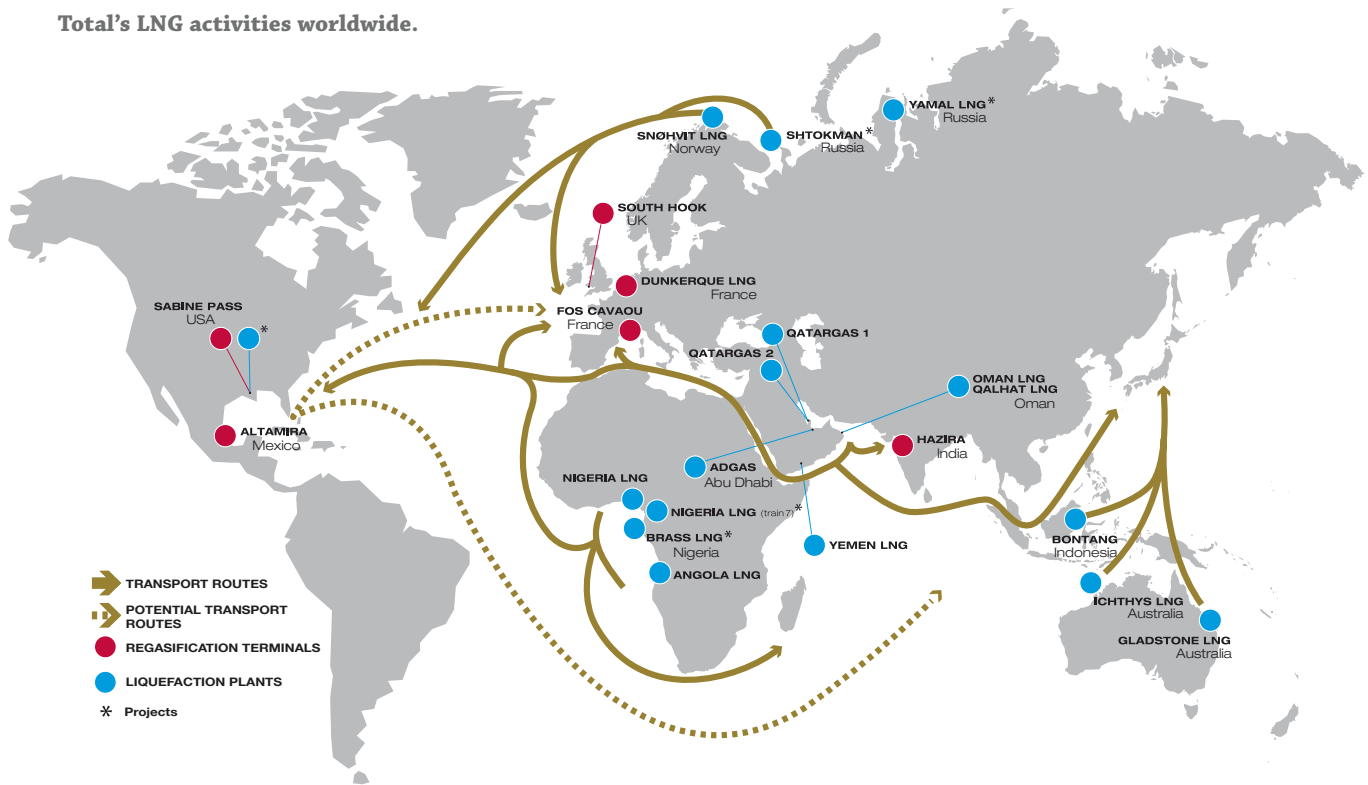
What is the current situation in the global gas market?

A solid LNG market has been formed around the principal regions of consumption: Asia, Europe and America. With the boom in unconventional gas, the United States has abundant domestic



The 145,000 m³ capacity LNG carrier Arctic Lady entered service in April 2006, seen here at the Bahia de Bizkaia LNG terminal, Bilbao, Spain.

Total's LNG activities worldwide.



production, which has reduced its LNG requirements. But at the same time, the Fukushima accident and the shutdown of 52 Japanese nuclear reactors, combined with steady growth in Asia, have led to a very sharp increase in demand for gas, hence a surge in “short-term” prices in the region.

Added to this is sustained European demand, particularly due to the decline in North Sea gas production.

Total is present in the main LNG markets, in most producing regions and throughout the gas chain. This means we can adapt rapidly to new circumstances and redirect the production of projects originally intended for the US market towards Asia – where conditions are advantageous. In fact, for several years we have been implementing a strategy to give us the flexibility to shadow market movements, for example by ensuring contracts include redirection clauses.

More generally, what is the Group's strategy for LNG?

Total is a pioneer of LNG and has reinforced its position over the last ten years by strongly developing its activities



The Seri Balhaf waiting to load LNG at Balhaf, Yemen.

downstream of LNG production. Total has positioned itself as an integrated player across the LNG chain, from gas production to sales, including transport and regasification. Our Group is now the world's second-largest player in LNG. In 2011, we produced 13.2 million tons of LNG, while LNG activities accounted for 27% of income from Upstream activities. Total has made this segment a major focus for development and intends to contribute significantly to meeting the fast-growing demand. Our objective is to produce around 20 million tons by 2020.

To continue to be a leader in LNG and achieve this objective, we are expanding the number of projects we undertake. Angola LNG will come on stream this year, we are strengthening our presence in promising countries like Australia with the Gladstone and Ichthys projects, and we are working on new major projects in Russia and Nigeria for launch by 2015.

Environment, Access and Advocacy Focus for IGU COP 18 Event

By Georgia Lewis

Promoting natural gas as a crucial fuel in a low-carbon energy mix continues to be a top priority for IGU and the annual UN Climate Change Conferences are an important platform for getting the message across.

IGU's presence at COP 18 in Doha consisted of an exhibition stand and a side event with five speakers on hand to promote the environmental and energy access benefits of natural gas. The side event "Natural Gas for a Global Sustainable Energy Future" was held on November 30, 2012 at the Qatar National Convention Centre where the COP 18 negotiations were also taking place.

Carolin Oebel, at the time Senior Advisor in the IGU Secretariat and now Director, opened

the symposium with an introductory address in which she cited three reasons why IGU's presentation at COP 18 was timely and relevant. She said that greater awareness of the considerable role natural gas can play in climate change mitigation was needed, that Qatar is a major producer of natural gas and the largest LNG exporter, and that the COP 18 event was also a good opportunity to promote the role natural gas can play in improving access to energy across the world.

After a brief explanation of the history and work of IGU, Ms Oebel said IGU aims to "promote the transfer of know-how globally" and to ensure natural gas plays an important role in economic development and to help improve

▼ Carolin Oebel moderated IGU's COP 18 gas event.



energy access around the world in a sustainable manner, especially as the world's population has now exceeded seven billion people.

Christina Hood, Acting Head of the IEA's Environment and Climate Change Unit was the first speaker. Her presentation took a data analysis perspective and cited the *World Energy Outlook* report, which features scenarios related to energy demand, resources and usage, as well as *Golden Rules for a Golden Age of Gas*, the 2012 follow-up report to *Are We Entering a Golden Age of Gas?*

Looking ahead to 2050, Ms Hood outlined the demand for fossil fuels in two different scenarios, one in which the average global temperature rises by 4°C, and one in which the temperature rises by 2°C. In both scenarios, the demand for natural gas remains relatively stable. "The question is not 'Gas or no gas?' but 'How much gas?'," she told the delegates.

Ms Hood pointed out that in the 4°C scenario (4DS), the cost of natural gas would grow steadily while in the 2°C scenario (2DS), there would be a peak in 2030 and the price would fall again with "a strong transition to renewables". The 2DS would also herald an increase in carbon capture and storage (CCS) technology and development and use of bio-gas, but natural gas would remain important until at least 2025.

Natural gas was described by Ms Hood as "a bridging fuel in the power sector but stronger in other sectors, such as industrial and building". She also said that in the next 10 years, gas will displace coal as the main source of fuel for power generation.

The unconventional gas revolution in the United States has had implications in the marketplace with changed trade flows, wider global distribution and more integrated gas trade routes, but Ms Hood also stressed that regulations are required to ensure unconventional gas is produced in a sustainable manner.

Ms Hood concluded that natural gas will continue to "retain an important role to 2050",



◀ Christina Hood of IEA: The question is not "Gas or no gas?" but "How much gas?".

especially in the power generation, industrial and construction sectors while coal and oil will be phased out more quickly.

Gas, the no-regret option

The second speaker was Mats Fredriksson, Senior Advisor in the IGU Secretariat, who started his presentation with an overview of IGU's *Global Vision for Gas* report.

Mr Fredriksson said a "portfolio approach" is necessary to "enhance the efficiencies of low-carbon technologies", including natural gas. He then offered several reasons why gas can be part of the solution. These include growing availability of natural gas, both conventional and unconventional, the clean properties of gas for urban living in an increasingly urbanised world, the lower carbon content of gas and cost competitiveness compared to other fossil fuels.

As well as concerns about carbon, Mr Fredriksson reminded the delegates of the importance of taking into account emissions of nitrogen and sulphur oxides (NO_x and SO_x). With gas, SO_x emissions, a trigger for acid rain, are negligible and NO_x emissions, which create smog, are 63% less than oil and 60% less than coal.

Mr Fredriksson then outlined ways that gas can help reduce emissions. He recommended actions such as replacing old equipment, improving infrastructure and changes in

consumer behaviour, as well as improved CCS technology and increased use of renewables in the long term.

Policy enablers are also important, according to Mr Fredriksson. At a government/policymaker level, coal to gas substitution and carbon capture solutions need to happen quickly and as such, appropriate finance and regulatory incentives are essential. He also recommended that the cost of carbon be included in the provision of energy and that this be transparent.

Mr Fredriksson concluded his presentation by saying: "Policymakers need to recognise the critical role of natural gas alongside other low-carbon options."

Natacha Blisson, from Statoil's Corporate Climate Division, started her presentation by saying that natural gas needs to "join forces with industry" so that it can be part of the solution rather than part of the problem.

Ms Blisson said that the emergence of the shale gas sector presents "risks and oppor-

tunities" and the industry is on a learning curve in the quest to ensure shale gas is produced in a sustainable way. She reiterated the sentiments of Mr Fredriksson, describing gas as "an attractive energy source fit for the future" and "a no-regret option".

In the short term, Ms Blisson advocated a shift from coal to gas and said that CCS development is essential to ensure gas has an important place in the long term. As such, Ms Blisson said that Statoil is preparing for a "more carbon-constrained world". As well as developing the company's gas business, Statoil is also investing in offshore wind farms in the UK, with gas-fired power generation as a back-up to intermittent renewables.

Ms Blisson was "quite confident" about the ongoing future of gas in the energy mix but said the industry needs to "communicate more that gas is part of the solution" and pointed out that more progress needs to be made with the shift from coal to gas in Europe.

► Statoil's Natacha Blisson: natural gas is a no-regret option.



Reducing environmental impact

Gas flaring reduction partnerships are another important part of responsible gas production, according to Ms Blisson. Since the 2002 launch of the World Bank initiative to reduce flaring, "significant reductions" have been achieved. As well as reducing emissions, reducing flaring improves efficiency and access to energy and to this end, Ms Blisson recommends more public-private partnerships. Government support of local gas markets and "stable, predictable, transparent regulations" will also assist with reducing flaring.

Ongoing dialogue with authorities, the development of local downstream businesses and best practice solutions for viable alternatives to flaring are also important, Ms Blisson told the delegates.

Vegar Stokset, Head of Communications for the Technology Centre Mongstad (TCM) was the next speaker. The TCM is based in Norway and is the world's largest testing facility for carbon

capture techniques. It is 70% owned by Norway's state-owned Gassnova, 20% by Statoil, 5% by Shell and 5% by Sasol, but the Norwegian government is looking to reduce its stake and other companies have been invited to join.

Mr Stokset played a video of a BBC News story about the TCM, which explained how it was built next to a power station and refinery in order to supply the facility with carbon for the testing procedures. A five-year test period started in 2012. The CO₂ is stored underground and two carbon capture techniques are being tested, one using amines to capture CO₂ from the flue gas and the other using a chilled ammonia process.

Mr Stokset said the main goal of the centre is to "establish CCS as a cost-effective and acceptable risk". He then outlined the other goals of the centre: to drive technical development and bring breakthroughs to the market; to be part of a global knowledge network and

exploit the synergy with other players; and to establish an operating model that is attractive to vendors. Aker, Siemens, Hitachi and Mitsubishi are all keen to test the amine method of carbon capture and Mr Stokset said this will become available to other vendors by 2014.

"Norway is punching above its weight in CCS," Mr Stokset told the event, citing the financial resources and technical competence of the country's oil and gas industry as reasons for the success so far of the TCM and other related initiatives. He also said that a carbon tax, introduced in Norway in the early 1990s, funds CCS projects.

The final speaker was Al-Anoud Darwish, Senior LNG Marketer (Short Term Trading and Optimisation, Marketing Department), for Qatargas.

Ms Darwish said that Qatargas aspires to be "the world's premier LNG company" based on principles of "safety, reliability, flexibility and integrity" and that includes "providing an



◀ Vegar Stokset from the Technology Centre Mongstad: Norwegian CCS projects are funded through a carbon tax.

◀ Al-Anoud Darwish of Qatargas outlined some of the company's main environmental achievements.

environmentally friendly fuel". She then outlined some of the company's main environmental achievements. These include ongoing water testing to ensure the company's operations are not impacting on seawater quality in the Arabian Gulf. The Jetty Boil-Off Gas Recovery Project (JBOG) is an example of how Qatargas is reducing its greenhouse gas emissions. The project aims to recover 0.6 million tonnes of LNG per year.

Qatargas has also been awarded the Global Gas Flaring Reduction Partnership Award by the World Bank. Qatargas's environmental activities are in line with the Qatar National Strategy 2011-2016, which includes the goal of using gas and energy more efficiently.

Debate

After the five presentations, there was time for discussion with questions from the floor. Ms Oebel asked the panellists about ways to achieve immediate climate change. Ms Hood responded by calling for improved domestic policies focused on investment in sustainable energy and for policymakers to "look at the whole system" rather than just focusing on specific parts of the system. Ms Hood gave the example of policymakers focusing on pushing renewables but not looking at ways to integrate cleaner fossil fuels, such as gas, even though they are still required.

Mr Fredriksson reiterated Ms Hood's points and added that it is important to have transparent carbon pricing and to ensure the pricing results in the lowest cost abatement. Ms Blisson elaborated on future emissions targets and said that companies and countries have a responsibility to work together and to commit to strong targets.

Mr Stokset said that in relation to CCS, the cost issue needs to be addressed with the big question being: "When can this be done commercially?". He said that demonstration plants such as the TCM are high-cost operations.

"It is not a technical issue, the technology works, it's a policy issue," said Mr Stokset. "While legislation comes in place, we will work hard to make [CCS] more efficient."

The first question from the floor was about whether LNG availability would be improved for the shipping industry so that it could take advantage of good gas prices. Mr Fredriksson said that LNG is "definitely an attractive fuel for shipping" and that it is already being used in Norway but availability certainly needs to be improved so ships can easily refuel at different ports. "Operators need to be confident that their vessels can go from A to B and be able to refuel," he said.

In response to a question about the challenges faced by CCS developers and projects to reduce gas flaring, Ms Hood agreed with Mr Stokset that stronger policymaking was required and that in the wake of the global financial crisis, funding needs to be made available. Ms Blisson said that in regard to gas flaring reduction programmes, it is important to examine whether the projects are working on their own or if the assistance of other agencies is required.

Commercialisation and funding of CCS was also discussed with Mr Stokset saying that in Norway, oil recovery was a means of funding CCS. Ms Hood added that a "revised technical roadmap to CCS" should include advanced oil recovery as part of the policy.

Also on the topic of gas flaring reduction, Ms Blisson said initiatives need to be open to new partners with a strong focus on best practice. She added that it is also important to examine what policies are needed and organisations such as IGU have an important part to play.

Ms Oebel addressed the issue of energy access, saying that all energy solutions, including gas need to be utilised to ensure developing countries and regions, such as sub-Saharan Africa, can overcome fuel poverty.

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Striking a balance between exploiting shale gas and other unconventional gas resources and protecting the environment and public health was also explored. Ms Hood said the IEA had published two reports based on modelling scenarios in relation to unconventional gas, a 2011 technical report on unconventional gas and a 2012 report on best practice for environmental regulations for unconventional gas. The reports made recommendations on where unconventional gas should and should not be developed and recommended that especially in the case of emerging markets, community engagement and a “social licence to operate” were crucial for energy companies to develop in a sustainable manner.

Mr Fredriksson recommended the IGU *Shale Gas* report which aims to provide accurate information on the industry, outline the step-by-step processes needed and cut through the polarised discussion.

The session concluded with Ms Blisson stressing the importance of ensuring all fuel sources were included in the energy mix and that a transfer of competencies was important as the world moves towards greater use of renewables. She said that natural gas is “part of the transition” and that there is an ongoing role for gas as “a destination fuel as well as a bridging fuel”.

Enhanced access to energy

The side event ended with a concluding statement from Ms Oebel, highlighting the main message from all the presentations, which was that natural gas can contribute to a better future in many different ways.

Ms Oebel said that natural gas offers “enhanced access to energy” for many regions globally and, while it is abundant, it should not be wasted. Therefore, projects such as those to reduce flaring are very important. Further development of CCS technology is also important to ensure natural gas remains a responsible choice.

As well as reducing CO₂ emissions, Ms Oebel reminded delegates that it is also important to reduce NO_x and SO_x emissions and that greater use of gas rather than more carbon-intensive fuels is a good way to do this, especially in cities. Natural gas can also help meet climate change targets as part of integrated energy systems and to this end, Ms Oebel emphasised the importance of partnerships between renewable sources and natural gas. Use of LNG and CNG is a means of addressing transport issues and improving energy access for communities where gas reserves are not indigenous.

Ms Oebel called for flexibility, saying it is important to “research in all areas” rather than predetermining outcomes. “Natural gas and natural gas systems can allow for integrating with other future systems,” she said. “We are open to creative ideas to use and re-use energy.”

In summary, Ms Oebel said the main requirements for mitigating climate change were to use less energy, use energy more efficiently and realise the synergies of integrating different energy sources. Establishing trust with stakeholders, improved technology and stable policy and regulatory frameworks were also necessary, according to Ms Oebel. And all this would need to be done quickly in order to ensure UN climate targets could be met.

As well as the presentations at the side event, IGU had an additional presence at COP 18 in the exhibition space with an information stand that was visited by many conference delegates. The Emir of Qatar, His Highness Sheikh Hamad bin Khalifa Al Thani, also mentioned the gas industry taking greater responsibility in his address to the conference: “Carbon dioxide emissions are being cut and gas flaring reduced. Qatar has paid great attention to sustainability and long-term environmental goals.”

Georgia Lewis is the Deputy Editor of International Systems and Communications.



Enhancing Europe's Energy Supply

The Trans Adriatic Pipeline (TAP) supports the European Union's strategic goal of securing future gas supply. TAP will start in Greece, cross Albania and the Adriatic Sea and come ashore in Southern Italy, allowing gas to flow from the Caspian region to European markets via the shortest pipeline route.

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For more information, please visit our website: www.trans-adriatic-pipeline.com

Approaching the home stretch in the race for Caspian gas

The world of energy is changing at an unprecedented pace. Many governments in Europe have stepped back from their previous commitments to nuclear and realised that immediate prospects for renewables appear less encouraging. By contrast, the outlook for the global gas industry in the long term is quite positive.

The development of the Southern Gas Corridor will be integral to this transformation, creating a new energy supply route for natural gas from the Caspian basin to markets in Europe. In June 2013, the Shah Deniz Consortium will make a historic decision on their preferred pipeline option.

The Trans Adriatic Pipeline (TAP) has all the qualities to win in this selection process and to become the pipeline opening the Southern Gas Corridor. Its strengths are convincing: the unmatched technical and commercial expertise of its shareholders (Norwegian Statoil, German E.ON Ruhrgas and Swiss Axpo), the shortest and most direct route to the largest European markets and the most competitive gas tariff offer. The

wide political support for TAP was confirmed on 13 February 2013, when the governments of Greece, Italy and Albania signed an Intergovernmental Agreement, demonstrating their full commitment to the pipeline project. Finally, TAP is the only pipeline not dependent on public money.

TAP's routing is strategic. The pipeline will seamlessly interconnect with TANAP at the Turkish-Greek border, cross Greece and Albania, allowing gas supply to South Eastern European countries including Bulgaria, Albania, Bosnia and Herzegovina, Montenegro, Croatia and others. TAP's landfall in Italy provides multiple opportunities for further transport of natural gas to the largest European markets such as Germany, France, the UK, Switzerland and Austria.

TAP is a pioneering project, technically and economically robust, agile and adaptable, more than ready to meet the challenges of our fast-paced and ever-changing energy world. When the first Shah Deniz gas becomes available in 2018, we will be ready to receive it.

Developments in Pipeline Inspection and Integrity Management

By David Hayes

Investment in gas pipeline inspection technology is increasing as operators seek to improve the maintenance and integrity management of their pipeline networks.

In addition to improved detection of cracks in pipe walls and joints, and better monitoring of interior and exterior pipe wall surface conditions, pipeline owners are keen to see improvements in pipeline construction, coating and jointing technology that enhance pipeline integrity during the initial construction phase and prevent defects such as cracking and leakages from occurring in later years.

This report looks at recent progress in gas pipeline inspection technology and improvements in construction technology and materials that have or are expected to assist pipeline operators with integrity management.

► Pipeline developments such as the series of West-East gas pipelines (the first line is pictured) have made a major contribution to China's economic growth.



ILI in China

Pipeline integrity management has become an important issue in China where the construction of natural gas and oil pipeline transmission networks during the past two decades has boosted energy supplies nationwide.

The country's largest pipeline operator is PetroChina Pipeline Company (PPC), which was awarded the 2012 Global Pipeline Award by the American Society of Mechanical Engineers for the application of in-line inspection (ILI) technology and the identification of spiral weld defects.

More than 70,000km of spiral welded pipelines have been constructed in China where the application of ILI technology is still at an early stage. Each year spiral weld defects cause many pipeline leakages that result in environmental damage and pose health risks and other dangers to nearby communities.

PPC together with GE PII of the United States have developed the use of tri-axial high-resolution magnetic-flux leakage (MFL) ILI technology to inspect spiral welding. The technical cooperation programme was launched as conventional ultrasound cannot detect and characterise flaws or defects in spiral welding, such as incomplete welding or a lack of fusion.

As part of the development programme PPC carried out a series of tests and experiments to establish a method for spiral weld defect signal recognition.

To date PPC has verified the performance accuracy of the new tri-axial high-resolution MFL ILI technology through its application in inspecting 3,000km of spiral welded pipeline. The company also has repaired many defects and leaks discovered during the development of the new spiral weld inspection technology.

According to PPC, the probability of detection using the new inspection technology is over 90%, while the sizing accuracy is plus or minus 15% in tests.

With the new tri-axial high-resolution MFL ILI technology performance now verified, PPC is continuing inspection work on its own spiral welded pipeline network. Other natural gas transmission companies in China owning spiral welded pipelines are expected to show interest in PPC's new inspection technology as they improve their own pipeline integrity management.

EMAT

Since the first commercial electromagnetic acoustical transducer (EMAT) ILI inspection runs were carried out in 2006, the length of pipeline inspected around the world and the amount of pipeline defect data collected which is used to derive the EMAT detection specification has grown rapidly. According to Rosen, a leading provider of EMAT technology, by the end of 2011 more than 10,000km of pipeline in the Americas, Middle East and Russia had been inspected using EMAT technology.

In addition, results from more than 2,000 pipeline excavations and corresponding ILI data have been gathered in a database so it can be used in validation processes as suggested by standards such as API 1163.

Results from EMAT inspection are now used to determine stress corrosion cracking (SCC) valve section severity, and to review and modify hydrostatic test schedules and intervals. In fact, confidence in EMAT technology has grown to the point where a number of pipeline inspection firms see the potential for using it as a viable alternative to hydrostatic testing.

EMAT technology applied in pipeline inspection tools can show linear anomalies in the pipe wall and identify the condition of the external pipeline coating by generating ultrasonic horizontal shear waves in the pipe wall utilising Lorentz force and magnetostriction,



two phenomena that result from alternating currents in a quasi-static magnetic field.

ILI tools using EMAT technology are currently available in sizes that cover all pipeline diameters ranging from 16in to 48in.

Crack detection, using a single EMAT probe to inspect a small dedicated area of pipe wall located between the transducer and receiver, results from transmission and reflection signals being captured by two separate EMAT receiver sensors. Many of these sensors are arranged around the perimeter of the ILI tool to provide full circumferential coverage of the pipe surface and a high resolution image of the pipe.

Obstacles and faults, such as cracks, that are located in the sensitive EMAT measurement

▲ TransCanada Pipelines has validated pipeline inspection results using EMAT technology with ILI tools.

▼ A 24/26in dual diameter Rosen EMAT ILI tool during the launching process.



area of the pipe wall are detected as they reflect part of the ultrasonic wave in the pipe wall as it travels from transducer to receiver.

Ultrasonic waves passing through the pipe wall unhindered are used to assess the state of the external pipe coating. Attenuation is reduced in areas where coating disbondment has occurred.

The quality of EMAT signals obtained from crack and coating measurements is supported by quantifying possible lift-off effects and magnetisation measurements.

Assessing external pipe coatings has various uses. Recently, EMAT technology has been used to compare girth welds coated in the field with polyethylene tape during construction tie-in welding with girth welds coated with liquid epoxy.

Canadian inspection

As part of efforts to increase pipeline owners' and inspection firms' confidence in the use of EMAT technology, Rosen has been involved in an important inspection programme with TransCanada Pipelines to validate pipeline inspection results using the technology with ILI tools.

Two 20in diameter sections of TransCanada's gas pipeline network were selected, both of which had histories of SCC and corrosion defects. One of sections selected was 300km in length, the other 150km.

The EMAT ILI tool used for the validation programme was able to identify all SCC and corrosion anomalies in the two pipeline sections, the data for which was then validated in the ditch through detailed anomaly sizing.

Protective coatings

As well as employing new advanced pipeline inspection technology as part of pipeline maintenance and repair programmes, gas companies are keenly aware that new developments in pipeline construction technology including jointing and the use of protective coatings on interior and exterior pipe walls provide an important opportunity to ensure the long-term integrity of their pipelines.

Apart from the company's involvement in developing EMAT inspection technology, Rosen is also involved in R&D work developing new pipeline applications for high performance elastomers from erosion protection to corrosion prevention.

Depending on its concentration and humidity, sour gas is able to deteriorate carbon steel pipes in a short period of time and high-density polyethylene (HDPE) liners do not provide a complete barrier against its corrosive impact. Sour gas accumulation behind the liner causes back pressure to build and the liner to collapse, with corrosion of the steel pipe occurring as a result.

► High performance elastomers were used to ensure the pre-construction integrity of the pipe sections used to build Nord Stream. The last pipe of Nord Stream's Line 2, number 99,953, is pictured being lowered onto the seabed in April 2012.





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► An engineer checks a gas meter after the earthquake and tsunami which struck Japan in March 2011.

Currently special alloys and galvanically-coated steel plate are used to make sour gas resistant pipe for use in certain situations where the use of these high cost solutions are feasible.

Rosen has developed RoPlasthan high performance elastomers that exhibit a complete absence of H₂S passage in standard laboratory tests using a saturated H₂S atmosphere. In addition, the lining did not swell nor show explosive decompression in CO₂ pipeline pigging. Further research work on this subject is in progress.

RoPlasthan elastomers were used to ensure the pre-construction integrity of thousands of steel pipe sections used to build Nord Stream, the world's longest sub-sea gas pipeline project. Nord Stream consists of two parallel 48in pipelines running 1,220km across the floor of the Baltic Sea from Russia to Germany.

Earthquake protection in Japan

Gas pipeline inspection and pipeline integrity are important issues in Japan where the country's leading city gas companies, universities and other engineering research centres have been involved in developing ILI inspection tools and new construction methods to improve gas pipeline integrity for several decades.

Tokyo Gas Company, for example, started to develop high precision ILI tools in 1989 as ILI tools then available were unable to pass through small-radius bends known as mitre bends that are a feature of the company's complex gas pipeline network.

The Kobe earthquake disaster in January 1995 led to further developments in Japanese gas pipeline construction technology. Analysis of earthquake damage caused to the Kobe City gas transmission and distribution network resulted in new construction methods and materials being employed for the reconstruction of the city's piped gas system. Lessons learned in Kobe also influenced gas pipeline construction and gas pipeline upgrade programmes throughout Japan.



Improving gas pipeline construction so that pipes and joints better withstand violent shaking and ground liquefaction that occurs during earthquakes is intended to minimise damage to gas pipe joints and the threat to life from fires caused by gas leakages.

One of the major changes introduced has been the gradual replacement of old iron distribution pipes by polyurethane pipes as iron pipes and pipe joints were found to crack more easily under the stress of earthquake forces than the polyurethane pipeline sections that had been used for newer sections of Kobe's distribution system.

Improvements to gas pipeline integrity subjected to earthquake forces were tested by the 2004 and 2007 Niigata earthquakes in East Japan and more recently by the March 11, 2011, Tohoku earthquake and tsunami disaster.

Damage to gas trunk lines and distribution pipelines in the Tohoku region is understood to have been far less severe for newer stretches of pipeline built after the Kobe earthquake incorporating an earthquake proof structure compared with old gas pipelines built using iron pipe and old construction methods.

Apart from preventing gas leaks and the threat of fires breaking out, avoiding earthquake damage to gas pipes is important because water pipes often run nearby. Damage to gas and nearby water pipes causes gas pipes to flood with water which has to be cleared before the local gas pipeline network can be put back into service after an earthquake.

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Worm-type ILI inspection tools

Gas pipeline operators' need for new ILI tool technology is not confined solely to medium and large diameter pipes. Research work continues in Japan to develop worm-type ILI inspection tools to inspect narrow diameter gas distribution pipelines used to supply customer premises.

Unlike gas companies in some other countries, which are responsible for gas pipe integrity management only to the point where the gas pipe enters the customer's premises, Japanese city gas companies are responsible for pipeline integrity and gas supply safety to the point where the gas pipe connects with the customer's gas appliance wherever it is located on the client's premises. In the case of residential customers gas pipes that may require inspection include narrow diameter pipes used to supply piped gas to cookers, water heaters, radiators and gas-fuelled air conditioning units.

Fibrescopes are currently used as industrial endoscopes to inspect narrow diameter gas pipes for defects. However, due to friction, fibrescopes cannot be inserted into pipes more than 15m long or pipes that run along complex routes that include multiple elbow joints.

To address these problems, researchers in the Department of Precision Mechanics in Chuo University's Faculty of Science and Engineering in Tokyo are working on developing self-propelling worm-type ILI inspection tools. These have a hollow internal channel made of ABS resin running their whole length to carry an endoscope that enables interior inspection of narrow pipe to be carried out.

The researchers have developed two self-propelling worm-type robots that mimic the peristaltic crawling motion of earthworms to move forward and to reverse. Both worm-type robots consist of several segments, each segment being fitted with an artificial muscle that is driven by pneumatics. The artificial muscle is made from micro-carbon fibre and low ammonia rubber latex which are light-weight low-cost materials.

The artificial muscle contracts in the axial direction and expands in the radial direction creating the peristaltic movement that enables the worm-type robot to travel through pipes.

In addition to the artificial muscle, each segment of the worm-type robot also consists of a small spring rolled aluminium sheet and two flanges, one at either end of the segments. These are connected to bendable joints consisting of a metal spring inside a natural rubber tube. Segments and joints are held in place using silicon tape. In addition a 1.4mm outer diameter fluoride tube passes through the crawling robot to act as an air tube.

The larger worm-type inspection robot has been tested inside 25A acrylic pipes that are 27mm in diameter internally. Made of six segments, a joint section and a top section, the robot weighs 98g and measures 480mm in length when fully extended. In experiments this robot was able to pass through pipeline elbows positioned on both horizontal and vertical planes.

The researchers also have developed a second peristaltic crawling robot able to travel through narrower 15A gauge pipes which are 16mm in internal diameter. The worm-type robot weighs just 9.8g and measures 190mm when fully extended.

In various tests crawling speeds of 8.9mm per second were recorded for the 25A pipe crawling robot and 7.8mm per second for the 15A pipe diameter worm-type robot.

Further R&D work is planned as the Chuo University researchers announced at the IEEE/Robotics Society of Japan International Conference on Intelligent Robots and Systems in October 2012. Research is now focusing on increasing crawling speeds and measuring the traction force that occurs when the worm-type robots are required to crawl through several closely situated elbows in a narrow pipe section.

David Hayes is a freelance journalist writing on the natural gas industry and energy markets.

the gas highway for europe for over 40 years



The transmission system operated by Eustream represents an important energy link between Russia and the European Union. It is interconnected with major European trunk lines in Ukraine, the Czech Republic and Austria. The basic mission of Eustream is to transport natural gas in Slovakia and through Slovakia to the European markets. A large part of Eustream's work concerns international gas transit.

Since 1972, Eustream has secured the transmission of more than 2 trillion cubic meters of natural gas across the territory of the Slovak Republic and successfully continues in more than 40-year tradition of international gas transmission.

Eustream operates a large-scale high-pressure gas transmission system with the biggest compressor station in the EU at the Slovak - Ukrainian border. A total output of nearly 300 MW is allowing an entry flow of almost 300 million cubic meters per day. The annual capacity of the transmission system is over 90 billion cubic meters.

We build up relationships with all business partners by way of a professional approach; we allow accessing the gas transmission network on a transparent and non-discriminatory basis in full compliance with gas industry legislation and standards. We react to market demands and offer a broad range of transmission services.

Thanks to the continual modernization and upgrading of infrastructure, Eustream contributes to ensuring safe and reliable gas supplies to Central and Western Europe. The company is investing into new equipment and environmental technologies in order to minimize the environmental impact of transmission system activities and to increase the reliability and safety of transmission.

Eustream, in close co-operation with adjacent network operators, is currently reviewing gas flow directions and cross-border capacities in order to enhance further the security of gas supplies to Europe.



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International Pipeline Update

By Mark Blacklock

Europe

In October 2012, the second line of the Nord Stream pipeline between Portovaya Bay near Vyborg in Russia and Lubminer Heide near Greifswald in Germany entered service bringing total capacity to 55 bcm/year. The Nord Stream partners are Gazprom, E.ON Ruhrgas, Wintershall, Gasunie and GDF Suez.

The following month the final investment decision was made for the offshore section of the South Stream pipeline. This will run 900km at depths of up to 2,250m beneath the Black Sea between Beregovaya near Anapa in Russia and Varna in Bulgaria, crossing the Turkish Exclusive Economic Zone. It will have an initial capacity of 15 bcm/year and is scheduled to enter service by the end of 2015. Ultimately,

four lines are planned to bring total capacity to 63 bcm/year. The South Stream offshore partners are Gazprom, Eni, EDF and Wintershall. In conjunction, FID has been reached for the onshore section through Bulgaria (partners Gazprom and Bulgarian Energy Holding), Serbia (Gazprom and Srbijagas), Hungary (Gazprom and MVM) and Slovenia (Gazprom and Plinovodi) to Italy. Branches to Bosnia and Herzegovina and Croatia have been proposed.

Meanwhile, a final decision is expected later in 2013 on Europe's long-proposed Southern Gas Corridor to transport gas from the second phase of the Shah Deniz development in Azerbaijan. The Shah Deniz partners are BP, Statoil, the State Oil Company of Azerbaijan (SOCAR), Lukoil, NIOC,

Total and TPAO. If Phase 2 gets the final go-ahead, production is expected to start in late 2017 and reach 16 bcm/year.

The various options for the Southern Gas Corridor have been narrowed down and the route now being planned starts with an expansion of the capacity of the South Caucasus Pipeline (SCP) through Georgia to transport the gas from Azerbaijan to Turkey. SCP is owned by the Shah Deniz consortium members. A new Trans-Anatolian Gas Pipeline (TANAP) will take the gas on to Turkey's western borders. TANAP was originally proposed by SOCAR, Botaş and TPAO, who have now been joined by BP, Statoil and Total. TANAP will then connect either to Nabucco West at the Turkish-Bulgarian border or the Trans Adriatic Pipeline (TAP) via the existing Turkey-Greece pipeline. In either case the initial onward capacity will be 10 bcm/year.

Nabucco West is a shorter, 1,300km version of the original Nabucco project running through Bulgaria, Rumania and Hungary to the Baumgarten gas hub in Austria. Nabucco's shareholders are Botaş, Bulgarian Energy Holding, FGSZ (a subsidiary of MOL), OMV, RWE and Transgaz.

TAP is proposed to run 792km between Komotini in Greece and San Foca in Italy, transiting Albania and the Adriatic Sea. The length of the offshore section would be 105km with a maximum depth of 810m. The partners are Axpo, E.ON Ruhrgas and Statoil. The likelihood of TAP being the chosen option increased in January 2013 when three members of the Shah Deniz consortium – SOCAR,



The route of the proposed Galsi pipeline. Italy's existing gas connection with Algeria (the Enrico Mattei pipeline) runs via Tunisia and Sicily.



South Stream's route and partners.

BP and Total – agreed to take a combined 50% stake in TAP.

The TAP option could impact on the business case for a second pipeline supplying gas from Algeria to Italy, albeit one that would serve Sardinia as well as the mainland. Galsi (Gasdotto Algeria Sardegna Italia) has been on the table for nearly a decade. With a capacity of 8 bcm/year it would run 837km with the subsea section between Algeria and Sardinia reaching depths of up to 2,824m. The international section is backed by a consortium of Sonatrach, Edison, Enel, Hera Group and the Region of Sardinia through its financial arm, Sfiris. Snam Rete Gas would be responsible for the Italian section.

Africa

Côte d'Ivoire is evaluating a connection to the West African Gas Pipeline.

Currently this 678km offshore pipeline links Lagos in Nigeria to Takoradi in Ghana, with delivery laterals from the main line extending to Cotonou (Benin), Lomé (Togo) and Tema (Ghana). Under the proposal, the pipeline would be extended from Ghana to Abidjan in Côte d'Ivoire.

Asia

The Myanmar-China gas pipeline with a capacity of 12 bcm/year is due in service in May. The pipeline is a project of PetroChina, Myanmar Oil & Gas Enterprise, Daewoo International, KOGAS, IndianOil and GAIL, and will transport gas from Myanmar's offshore fields. The pipeline starts at Ramree Island and runs 793km to Kunming in Yunnan Province.

A third line of the Central Asia-China pipeline is under construction which will boost overall capacity to

55 bcm/year by 2015. The pipeline starts at Gedaim on the border of Turkmenistan and Uzbekistan, and runs through Kazakhstan to Horgos in China. Line C will connect to PetroChina's third West-East Gas Pipeline (WEGP) of which construction started in October 2012. WEGP 3 will run between Horgos in Xinjiang and Fuzhou in Fujian. Its total length will be 7,378km, including a 5,220km trunkline and eight branches. WEGP 3 will have a capacity of 30 bcm/year and completion is scheduled for 2015.

The long saga of international pipeline projects to export Iranian gas continues and the latest news is that Iran may offer Pakistan finance to build its section of the Iran-Pakistan pipeline. (For a review of the geopolitical issues which was carried out by an IGU Task Force see *International Gas*, April 2009, pages 234-253).

Slovakia Celebrates Transmission Anniversaries

By Ján Klepáč

IGU Charter Member, the Slovak Gas and Oil Association (SGOA) celebrated three significant anniversaries for Slovakia's petroleum and gas industry by organising a special conference entitled "The Central European Gas-Oil Transmission Corridor" on September 18, 2012. The gala event marked the 50th anniversary of the commissioning of the Druzhba (Friendship) international oil pipeline, the 45th of the Bratstvo (Brotherhood) international gas pipeline and the 40th of the first line of the Eustream transit gas pipeline system.

The conference was held in the Historical Building of the National Council of the Slovak Republic in Bratislava under the auspices of the Prime Minister, Robert Fico, and the Vice President of the European Commission, Maroš Šefčovič. The participants included: Tomáš Malatinský, Minister of the Economy of Slovakia; Alexander I. Medvedev, Vice President of Gazprom and Director General of Gazprom Export; Mikhail V. Barkov, Vice President of Transneft; Torstein Indrebø, IGU Secretary General; and senior representatives of the jubilee companies.

The conference motto was "Safety-Reliability-Cooperation", reflecting the safe and reliable operation of the important transmission corridors in Slovakia, which has been due in particular to the excellent cooperation of all stakeholders.

Over the past 50 years, more than 700 million tons of crude oil has been transported via the Druzhba pipeline, while over 45 years more than 100 bcm of gas has been transported via the Bratstvo pipeline, and over 40 years more than 2,200 bcm of natural gas has been transported from Russia to Europe via the Eustream transit system. The latter amount would be sufficient for Slovakia for 410 years at an average annual gas consumption of 5.4 bcm.

Oil transmission

Slovakia's crude oil transmission capacity is some nine million tons a year via the Druzhba pipeline which has a total length of approximately 5,500km. Its "source" is in the Bashkort Autonomous Republic of the Russian Federation to the east of the Volga River. In the Belarus town

► The working part of the conference was followed by informal discussions.

From left to right:

Pavol Janočko, Eustream Director General and SGOA President; Torstein Indrebø, IGU Secretary General; Eric Dam, President of Energy Delta Institute and Chairman of IGU's WOC 3 (Transmission) 2009-2012; Alexander I. Medvedev, Vice President of Gazprom and Director General of Gazprom Export; and Ján Klepáč, SGOA Executive Director.



of Mozyr it splits into two parts: the northern branch goes to Germany through Poland, while the southern branch goes to the Czech Republic through Ukraine and Slovakia. At Šahy in Slovakia there is a further branch to Hungary.

The first shipment of oil came into the Slovnaft Bratislava underground storages in February 1962; although the whole Druzhba pipeline was not officially commissioned until October 1964. Increasing demand for oil in the late 1960s resulted in a need to increase pipeline capacity. Accordingly, in 1974 the construction of the Druzhba-2 oil pipeline was completed. In Slovakia, Druzhba's length is around 440 km and it is made up of two parallel pipelines.

Gas transmission

Slovakia's transmission system forms a reliable section of the international transmission network and is the largest highway for Russia's gas to Europe. The high pressure transmission system interconnects with the main routes of Ukraine, the Czech Republic and Austria and has a capacity of 94 bcm. It is operated by the Eustream company. The system comprises of four to five parallel pipelines with a total length of 2,270km and includes the largest compressor station in the EU, located on the Slovakian-Ukrainian border in Veľké Kapušany. Access to the Slovakian transmission network is secured

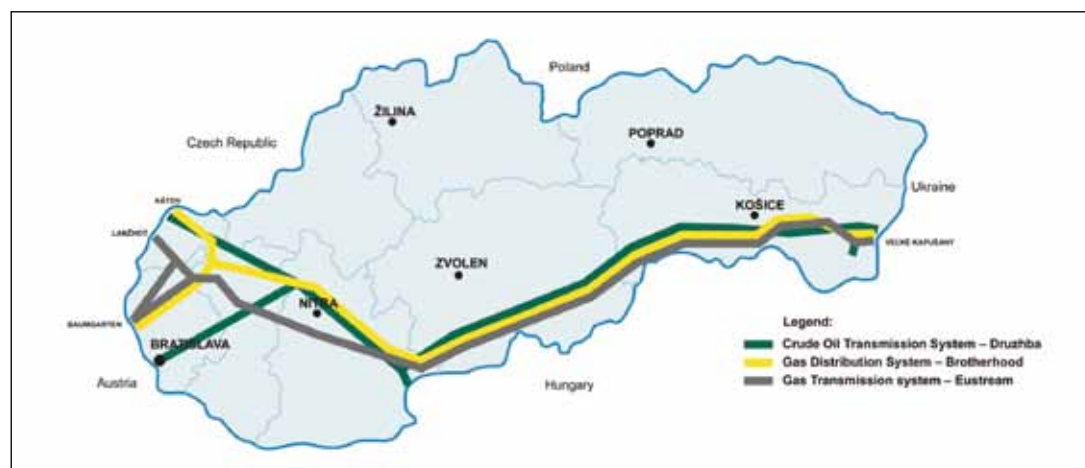
in full compliance with European and Slovakian legislation.

By means of the domestic input-output point, the transmission network allows access to the Slovakian distribution grid as well as to the underground storages of natural gas in Slovakia, whose capacity amounts to almost half of the annual consumption of the country.

The antecedent of the present Eustream transmission corridor was the Bratisvo pipeline, which has transported natural gas from Russia to Slovakia since 1967 and, from 1968, has also served as the first transmission gas pipeline across Slovakia. Until 1973, 5 bcm of gas flowed into Austria. Today, it is part of the distribution grid in Slovakia.

Eustream ranks among the largest natural gas transporters in the EU and, as an important operator of European infrastructure, has been engaged in international transmission system interconnection projects between Slovakia and Hungary, and Slovakia and Poland. Both projects, supported by the European Commission, form a part of the north-south corridor concept focusing on interconnection of the transmission networks of the Central and South-Eastern European countries.

Ján Klepáč is Executive Director of the Slovak Gas and Oil Association (www.sgoa.sk) and a member of the IGU Council.



◀ The routes of the gas and oil transmission pipelines through Slovakia.

Addressing Skills Shortages – a Case Study from Tunisia

By Rafik M'barek



▲ Rafik M'Barek: ETAP has developed a nine-point strategy to address its HR issues.

Natural gas accounts for 54% of Tunisia's primary energy consumption and the country's NOC, Entreprise Tunisienne d'Activités Pétrolières (ETAP) has ambitious plans for further development. However, ETAP is facing a shortage of skilled technical personnel and the company needs to recruit, train and retain sufficient engineers to support the growth of the gas industry.

ETAP has developed a nine-point strategy to address its human resource (HR) issues, and is participating in the work of Task Force 1 – Human Resources to share experiences and refine best practices.

Recruitment policies

Management is responsible for ensuring that a company has high-quality employees. A key way of fulfilling this responsibility is to implement pro-active and appropriate recruitment policies and to conduct successful succession planning.

Employees leave their jobs either on a planned or unplanned basis. Planned termination usually occurs because of the employee's retirement or career change. Successful and

smooth retirement transition requires years of advance planning. Unplanned termination may occur because of sudden illnesses or death, or the poor attractiveness and performance of the company. This situation can lead to sudden crisis management to cope with HR shortages.

When oil and gas prices fell in the 1990s, both IOCs and NOCs stopped recruiting to cut costs. As an example, *Figure 1* shows staff changes for ETAP. The net outflow of staff between 1997 and 2007 was due to the recruitment freeze. Today, this freeze is seen as a mistake and the right approach is to delink recruitment campaigns from oil and gas prices.

In addition to tackling shortages of skilled staff with recruitment campaigns and training programmes, other related issues should be addressed such as the disproportionate number of seniors to juniors, future leadership problems and the absence of a mentoring culture.

The lesson to be learned is: do not wait until the employee leaves. Be pro-active and start planning early and maintain a continuous recruitment drive for key technical staff.

► The recruitment and retention of skilled technical staff is a vital issue for the gas industry.



Mentoring

Mentoring can be one of the most effective and efficient means of transmitting competencies from seniors to juniors. However, in a state-owned company such as ETAP legislation does not allow the contracting of retired professionals. The solution has been to encourage retired employees with valuable expertise to form an association whose premises and social activities are financed by ETAP. The association is located near ETAP's headquarters for ease of access by the junior engineers being mentored.

Succession planning

Companies need a process for preparing staff to fill critical business and technical positions in the future, either in the short or the long term. Well-defined succession planning helps provide strong leadership and the ability to deal with a changing business environment. This translates into vision building and successful performance both for the individual and for the company.

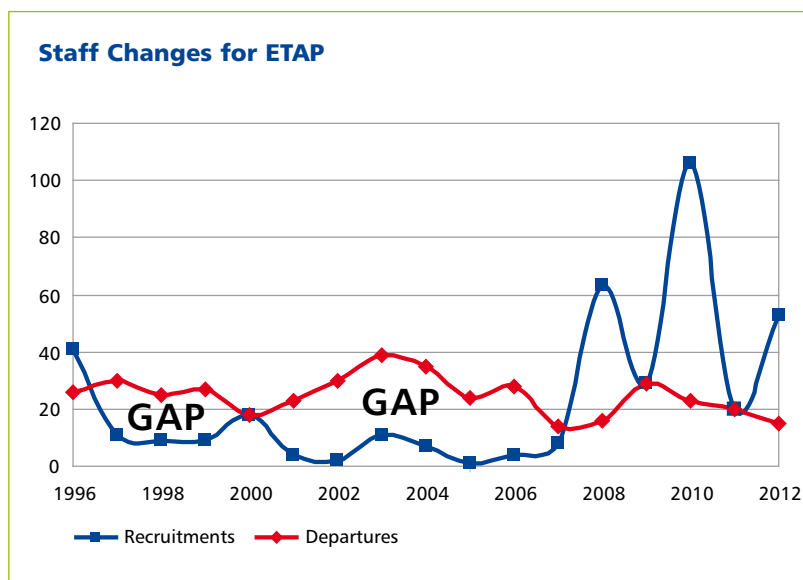
ETAP has analysed the retirement plans of technical staff in each speciality and is working with seniors to transfer their knowledge to juniors as part the company's succession planning.

ETAP is committed to high standards of corporate governance and hence succession planning. This will ensure that there is continuity and availability of the right kind of leadership and skills in the business and will have a major impact on corporate success in the forthcoming years.

Staff development

Accelerated individual development programmes for promising employees are imperative to help them reach their full potential. These programmes should identify their abilities, motivations and growth opportunities.

ETAP has allocated a budget (approximately 10% of the annual payroll) for a training programme targeted at the company's junior engineers. This ensures that employees will feel



valued and motivated by their career path as well as the company's continued success.

▲ Figure 1.

Performance measurement

Effective HR management makes a major contribution to employee motivation. It is important to ensure that the work people do is satisfying and rewarding, that the salary, bonus and reward system is fair, and that good performance is acknowledged and rewarded. Motivated staff are satisfied and productive and direct their effort towards achieving company goals.

In terms of salaries, ETAP as a state company cannot compete with IOCs and is hence vulnerable to losing employees. Staff turnover is increasing and it is becoming difficult to retain specialised engineers. As a result, the company is implementing a competence and performance system to attract and retain talented staff. This system is based on bonus pay for performance which gives employees a sense of ownership and enhances productivity. The following points were considered before the adoption of this system:

- ◆ Benchmark and best practices across the oil and gas industries;
- ◆ Salary survey of petroleum companies established in Tunisia;

- ◆ Analysis of current salary range and actual pay as compared to ETAP's subsidiaries;
- ◆ Clear links between performance and reward that are understood and accepted by all.

Alliance with E&P partners to optimise HR

More than 55 foreign oil and gas companies are operating in Tunisia, representing partnership opportunities for the optimisation of human resources. Alliances and more coordination for the use and exchange of technical staff will be fruitful for all companies. In addition, the involvement of ETAP's junior engineers in all exploration and production projects with partners is considered a part of their individual development plan.

Cooperation with educational institutions

The role of schools and universities is very important in developing a human capital strategy. Here is the front line where the industry should intervene by encouraging new generations to study STEM (science, technology, engineering and mathematics) subjects. We are convinced that more emphasis should be put on STEM as a key ingredient in the development of a successful human capital strategy. This represents the first objective of Task Force 1 and its deliverables on this subject will be valuable for the industry.

One recommendation is that countries with plenty of technical graduates could provide a talent pool for others. Some 42% of university students in Tunisia are studying STEM subjects,

making the country a serious candidate for offshore recruitment.

The second line of cooperation with universities is the development of customised technical courses. ETAP has adopted this approach and in recent years has organised six specialised masters in several petroleum disciplines (geophysics, geosciences, production-reservoirs, drilling, petroleum engineering) in collaboration with state and private universities. This approach has been very successful and should be a continuous process.

Launching a "corporate university"

Having developed courses with universities, ETAP is now evaluating a project to establish its own "corporate university" with the support of the government. This would improve the quality of the student intake and offer choices of meaningful careers in which each student could achieve their personal and professional goals and contribute to society. This project could cover the whole energy sector (renewable energies, electricity, etc.) in a subsequent phase.

Attracting and retaining female staff

The significant barriers that obstruct women's full and equal participation in the predominantly male oil and gas industry should be addressed and several incentives should be implemented.

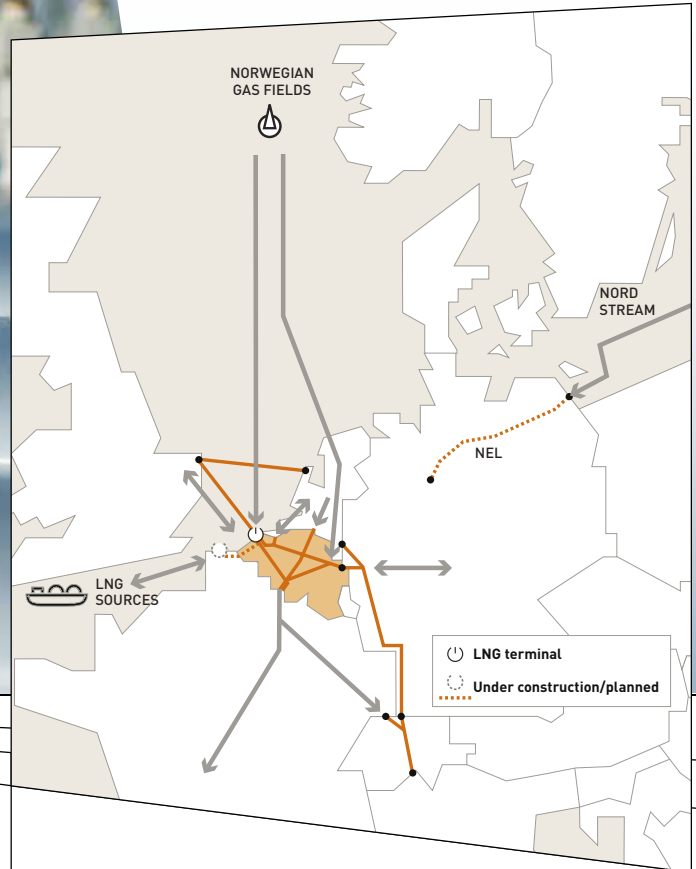
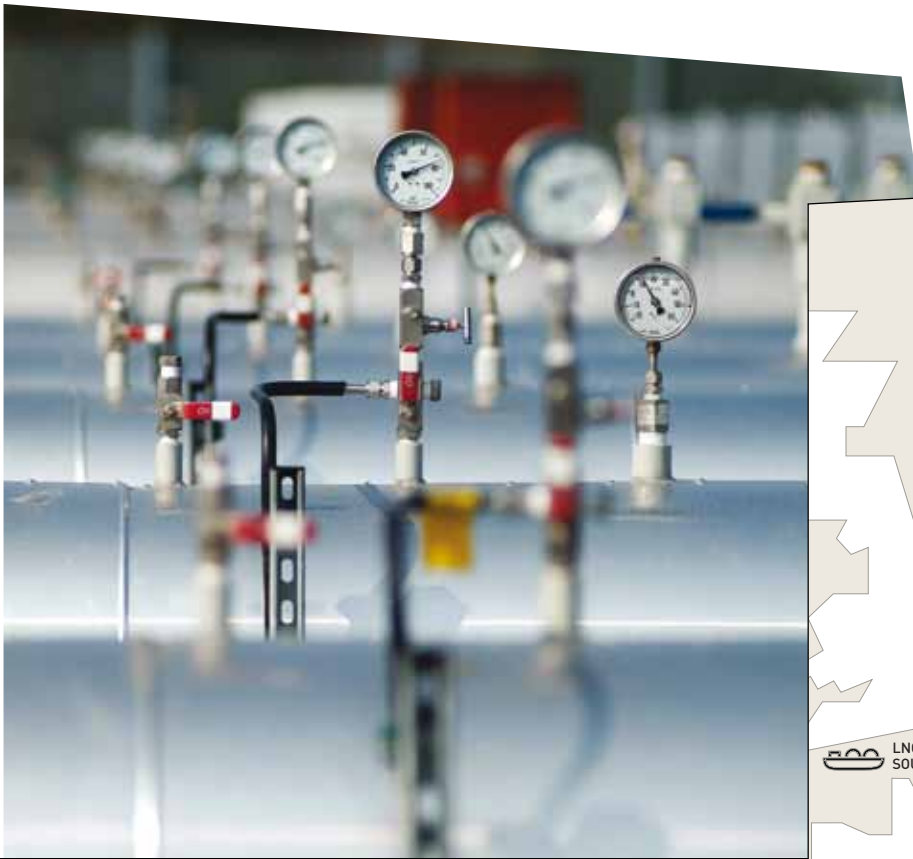
The female share of overall student numbers in Tunisia has increased slightly in recent years, from 59% to 61.5%, while the female share of graduate students is 62% (see Figure 2). One of the trends is the significant growth in the last 10 years in female enrolment in technical-related university programmes (engineering disciplines, as well as geology and geophysics).

Attracting talented women is a strategic objective for ETAP which has carried out an internal survey into the barriers and boosters to female employment (see Figure 3). The information gathered by this survey will be

▼ Figure 2.

	2007/2008	2008/2009	2009/2010	2010/2011
Overall student numbers	335649	349142	346079	336017
Female share (%)	59.1	59.5	60.3	61.5
Total graduate students	60613	65630	86035	N/A
Female share (%)	61.3	62.6	62.4	

Source: Ministry of Higher Education and Scientific Research



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Attracting and Retaining Female Technical Staff in the Oil and Gas Industry

Barriers (classified by priority)

Family obligations
Mobility constraints
Low female representation in top management positions
Beliefs and values
Work/life balance
Perceived lack of career advancement
Discrimination
Image of the sector
Language barrier
Attractiveness of another sector
Education system
Salary competition

Boosters (classified by priority)

Childcare facilities within company premises
Working time flexibility
Bridging programmes and training for non-traditional occupations (professional coaching and mentoring)
Promote career possibilities offered by the industry
Improving social responsibility (demonstrating that the industry is bringing development and not only exploiting local natural resources)
Gender equality in career advancement (rotation across functions and disciplines)
Gender awareness training programmes
Introduction of harassment prevention policies
Diversity-sensitive selection and hiring processes
Improving female life style and networks (pleasant work environment)
Attractive remuneration package

► Figure 3.

used to develop a human capital strategy and a practical action plan to attract women to our industry.

ETAP will use the results of this survey to provide management initiatives that deal with gender-related issues and overcome the barriers identified. Some examples of initiatives regarding working time flexibility have been successfully implemented by laws (such as half-time working with two-thirds salary compensation) but a lot of work remains to be done.

Role of IGU

The Tunisian experience is being drawn on for the work of Task Force 1. We are confident that the Task Force deliverables in terms of surveys, regional workshops and the sharing of best practices through the IGU network will make a major contribution to the building of a human capital strategy for the oil and gas business.

IGU has a vital role to play as a collaborative platform for sharing best practices. By working together, IGU members can develop common solutions to the problem of staff shortages.

In conclusion, we believe it is important to reinforce IGU's role as regards education and the following initiatives are suggested:

- ◆ Working hand-in-hand with universities to develop human capital;
- ◆ Persuading talented young engineers about to make a career decision to consider working in the gas industry and contributing to a sustainable energy future;
- ◆ Encouraging interest in science and technology by the establishment of research centres in cooperation with universities;
- ◆ A commitment by the country holding the IGU Presidency to run gas education programmes for IGU members during its triennium;
- ◆ Awarding scholarships to promote the study of gas specialities;
- ◆ Nurturing young engineers through a mentoring programme using volunteers with different areas of expertise and operating via the IGU website and social media.

Rafik M'barek of ETAP is a member of Task Force 1 – Human Capital.

Securing the Golden Age of Gas

By Nobuo Tanaka

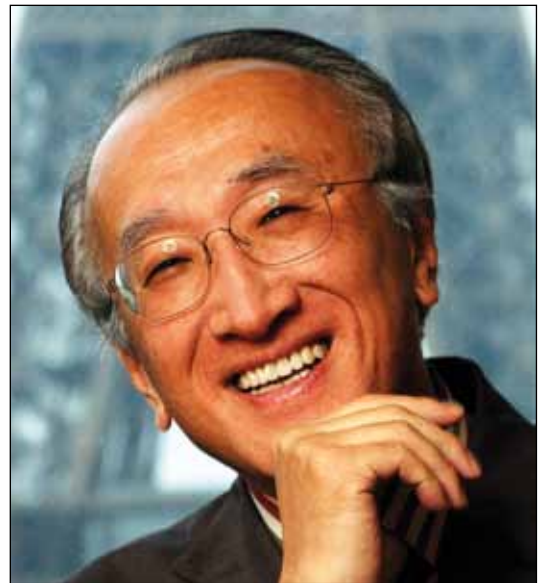
IGU is delighted to announce that the distinguished Japanese energy expert Mr Nobuo Tanaka has joined the Wise Persons Group. Here he outlines what he sees as the key economic and environmental issues for the natural gas industry in the Asia-Pacific region.

There are three sets of gas prices in the world: those linked to the North American Henry Hub price, European prices and Asian long-term contract-based prices, the latter usually linked to the price of oil. The growth of global LNG trading was expected to lead to regional price convergence, but in fact the differentials have widened. Asian importers now pay five times more for natural gas than North American users.

How can the so-called Asian premium be eliminated? This question has been discussed by delegates to many conferences in which I have participated recently including the 3rd IEF-IGU Ministerial Gas Forum.

Oil-price indexation made sense when countries reliant on oil were trying to develop a supply chain for natural gas in the form of LNG after the oil shocks of the 1970s. Long-term contracts enabled investors to commit the large amounts of capital needed to develop liquefaction plants and shipping fleets, and the LNG market has grown to account for 10% of global gas consumption. Now the gas market is very different.

Firstly, let's think about the supply side. Thanks to the shale revolution, the price of gas in the US has fallen dramatically. The Henry Hub price averaged \$2.75 per million Btu in 2012 compared to \$4 in 2011 and \$8.86 in 2008. An important recent factor has been the concentration on wet gas production to extract more profitable natural gas liquids and on shale oil, with the flood of associated dry gas driving



down prices. The higher the oil price, the cheaper the gas available in the US.

The boom in domestic gas supplies means the US no longer needs to increase LNG imports – as was forecast a decade ago – but rather it will export to Japan and Asia based on the Henry Hub price from 2015. Already, Japanese utilities have negotiated some Henry Hub-linked contracts for diverted gas originally destined for the US.

Lower prices are prevailing via another route. Cheap gas is substituting for coal, renewables and nuclear power in the US. In turn, surplus US coal is being exported to Germany where it is not only replacing nuclear but is also reducing demand for gas, putting downward pressure on the price of pipeline gas from Russia.

Secondly, let's consider the demand side. China and India are the game changers, needing huge amounts of gas for sustainable growth. How much they import will be determined by their future domestic unconventional

► Nobuo Tanaka: we are very near the Golden Age of Natural Gas.

gas production, although the gas price must be competitive with cheap domestic coal.

Japan also needs additional gas (and oil) following the Fukushima nuclear accident, and is paying an extra ¥3-4 trillion (\$33-44 billion) a year. The Abe government, which took office in December 2012, clearly understands that zero nuclear is not sustainable and is even politically irresponsible. In the past, Japanese utilities have focused on stability of supply but now they need to consider affordability for their consumers. They have a strong incentive to reduce costs by directly investing in foreign projects to get cheaper gas. In the longer term, energy market reform will take place with some form of unbundling, and the utilities will face much tougher competition from newcomers such as gas companies entering the power generation market, renewables supported by a feed-in tariff and in-house generation by manufacturing companies.

Long-term oil indexation pricing cannot survive in the coming years. The alternative is to establish market-based pricing but we need to create a true gas market in Asia. The first step must be the elimination of destination restriction clauses in LNG contracts as has been done in Europe. Shorter and more flexible contracts – as recommended by the International Energy Agency (IEA) – will also improve the functioning of the market.

Environmental sustainability

Another persistent concern is the environmental sustainability of hydraulic fracturing. IEA has drawn up the Golden Rules to make a Golden Age of Gas happen. The Golden Rules underline the importance of full transparency, measuring and monitoring of environmental impacts and engagement with local communities; careful choice of drilling sites and measures to prevent any leaks from wells into nearby aquifers; rigorous assessment and monitoring of water requirements and of waste water; measures to target zero venting and minimal flaring of gas; and improved project planning and regulatory control.

The Golden Rules may increase costs by as much as 7% in a typical gas drilling site. However, there is shale gas development potential around the world; the Golden Rules could help expand domestic production in many countries and eventually help them reduce import bills.

We are very near the Golden Age of Natural Gas. We can secure it by introducing better disciplines and regulations as well as making changes in the gas market.

Nobuo Tanaka is Global Associate for Energy Security and Sustainability at the Institute of Energy Economics, Japan (<http://eneken.ieej.or.jp>).

Biography

Nobuo Tanaka joined Japan's Institute of Energy Economics (ENEKEN) as Global Associate for Energy Security and Sustainability in September 2011. From September 2007 to August 2011 he was Executive Director of the International Energy Agency (IEA). Mr Tanaka began his career in 1973 in the Ministry of Economy, Trade and Industry (METI) in Tokyo. He has extensive national government and international experience within METI, the

Embassy of Japan in Washington DC and the OECD. In METI he served in a number of high-ranking positions including Director General of the Multilateral Trade System Department in the Trade Policy Bureau. He joined OECD twice, the most recent being as Director for Science, Technology and Industry. Mr Tanaka, a Japanese national, has a degree in Economics from the University of Tokyo and an MBA from Case Western Reserve University, Cleveland, Ohio.

Reports from the Regional Coordinators

Following a resolution of the Council in October 2009, IGU's first Regional Coordinators were appointed for the 2009-2012 Triennium with four regions being defined. For the 2012-2015 Triennium there are five regions. The current Regional Coordinators were appointed by the Executive Committee in October 2012 and two have contributed to this issue. Reports from the Regional Coordinators for Africa and the Middle East, Russia-Black Sea-Caspian and North and South America will follow in the October 2013-March 2014 issue of the IGU Magazine.

Asia and Asia-Pacific

A statement by Kang Soo Choo

The Asia and Asia-Pacific region is the fastest growing market and also one of the major producers of gas, with a huge potential of bringing more vitality to the global gas industry. This region has the largest LNG importers such as Korea and Japan, and major gas producing countries like Malaysia, Indonesia and Australia. Emerging major gas consumers such as China and India are also found in this region, not to mention ASEAN countries that will play a more prominent role in the industry. Indeed, the Asia and Asia-Pacific region is going to be the main driving force for the advancement of the gas industry as well as the global economy.

Serving as the Regional Coordinator, I would like to contribute to the mission of IGU in promoting the progress of the global gas industry by strategically facilitating free and open communication among the members of this significant region. Based on the strategic



guidelines of the French Presidency of IGU, expanding the use of natural gas will be our focus.

I will utilise meetings and conferences to encourage productive interaction among gas producing countries and gas importing countries in the region. These two groups have different characteristics and demands, which might be at odds or in accordance with each other. For the mutual benefit of those countries in the region, common goals should be found and new ways of maximising synergies will be discussed.

I would also like to promote the active participation of the emerging countries and potential IGU members in the region – countries that do not utilise gas yet. The more

► Kang Soo Choo.

regional members participate actively, the better we can hear various voices from different economies of the region, and consider the gas issues in a global context. As a catalyst, I will stimulate the involvement of newcomers to the gas industry, helping them gain knowledge and experience from the members of the region. This will enable the region to “grow together”, the vision of IGU for the 2012-2015 Triennium.

In this way, I would like to achieve the primary goal of every Regional Coordinator, improving our understanding of the regional gas market. Surely, when acquired knowledge and experiences are shared not only within the Asia and Asia-Pacific region but also other regions, we shall come up with a better solution that will promote the development of IGU, eventually the global gas industry, marching as one community towards the Golden Age of Gas.

Kang Soo Choo, President & CEO of KOGAS, is the Regional Coordinator for Asia and Asia-Pacific.

Europe

A Q&A with Gertjan Lankhorst

What do you see as the major challenges facing the gas industry in your region?

Obviously, the main challenge in Europe is to get some pragmatism into the discussion. I can understand that the EU aims at phasing out fossil fuels, including natural gas, in the long run. But over the next decades we will remain dependent on them. Besides, we need clean natural gas not just to secure enough energy supply, but also to decrease CO₂ emissions, at least in the short- and mid-term but most probably much longer.

What are your aims as Regional Coordinator?

To make sure that the IGU engages with all of its stakeholders. Traditionally, IGU has been a rather inward looking organisation, very much

business to business. If we want to make gas advocacy a success, IGU needs to share its views with governments, politicians, NGOs, scientists and society as a whole.

How do you plan to achieve them?

By using every opportunity to exchange our viewpoints with opinion leaders and decision makers and by developing dedicated professional communication tools, if possible together with other, regional gas associations. Externally, we must be much more pro-active.

How do you see IGU membership expanding in your region?

IGU will flourish if the gas industry understands that their interests are well served by it.

Gertjan Lankhorst, CEO of GasTerra, is the Regional Coordinator for Europe.

▼ Gertjan Lankhorst.



Meet Carolin Oebel, the IGU Secretariat's New Director

By Georgia Lewis

Carolin Oebel became the new Director of the IGU Secretariat in January 2013, replacing retiring Director Hans Riddervold. Previously, Carolin was Senior Advisor to the Secretary General. She joined the IGU Secretariat in 2010 and is on secondment from E.ON Ruhrgas. The secondment is scheduled to run until the end of October 2014.

Carolin says that in her new role as Director, she will have a "strong focus on gas advocacy" and says that having a presence at

events such as the UN Climate Change Conferences is one way to increase the awareness of the role of gas as part of a long-term energy solution.

The role gas can play in improving access to energy is also important to Carolin. She says she is looking forward to "more activities in relation to access to energy, [and to] focus on future advances, with gas as a strong contributor to sustainable energy for all".

She has already made a start with her more visible role: during COP 18, held in Doha, Qatar, November 26-December 7, 2012, Carolin was the moderator for IGU's side event, "Natural Gas for a Global Sustainable Energy Future". The event covered the topic of how natural gas can mitigate climate change and touched on the issue of the role of natural gas in accelerating energy accessibility to those in need (see report on COP 18 on pages 168-174). Prior to that, Carolin participated in an Atlantic Council event in Budapest, Hungary, October 4-5, 2012, where she gave a presentation on behalf of IGU on the "Global Vision for Gas – The Pathway to a Sustainable Energy Future".

Carolin received a Master's Degree in International Management from the Community of European Management Schools (CEMS) and a German Diploma in Economics from the University of Cologne in 2004. Prior to that, she studied at the University of Cologne, Germany, and the Stockholm School of Economics, Sweden.

After some working experience in London and Shanghai, Carolin joined E.ON AG in 2005 via the company's graduate programme. In this role, she was given different assignments



▶▶ Carolin moderated IGU's side event during COP 18. She is seen here addressing delegates (OPPOSITE PAGE) and with Vegar Stokset of Technology Centre Mongstad, who was one of the panellists (RIGHT).

in the fields of project management, strategy and economic policy in Germany, the UK and Belgium. Between 2006 and 2010, Carolin worked on various projects in the strategy department of E.ON Ruhrgas AG and her most recent position with the company was Department Manager, Strategy Implementation. Her work at E.ON has focused in particular on exploration & production, infrastructure as well as other markets, and she has worked closely with the company's business development units.

In September 2010, E.ON Ruhrgas seconded Carolin to the IGU Secretariat, and she has enjoyed the opportunity to work with members from around the world. This is set to continue in her new role in which she sees IGU members as much a part of the team as the Presidency and the IGU Secretariat staff:

“Global teamwork is key for our work as we are truly an international organisation: I have the opportunity to use the languages I’ve learnt and work closely together with people from all around the world.”

“The work to make IGU and gas more visible to people outside the industry is a key focus of IGU in general and the IGU Secretariat in particular,” says Carolin of the organisation’s role on the global stage. And she adds that it is important for IGU to continue to connect with external parties, such as policymakers, so that the benefits of natural gas can contribute to a diverse energy portfolio in the best possible way. Therewith, natural gas can also play its role in mitigating climate change and improving access to energy.

Describing the future potential of the global industry as “very positive”, Carolin hopes to build on what she sees as the “considerable achievements” IGU has already made in promoting gas as a crucial fuel into the future.

Georgia Lewis is the Deputy Editor of International Systems and Communications.



Global Vision Symposium in Oslo

By Mark Blacklock

An important part of IGU's work is reaching out to brief people on natural gas and its role in a sustainable energy future. The Union cooperates with other organisations to reinforce its gas advocacy initiatives and reach a wide range of audiences from policymakers to the general public.

On February 21, IGU joined with the German-Norwegian Chamber of Commerce to hold a symposium in Oslo. The aim was to bring the findings of IGU's report "Global Vision for Gas: The Pathway towards a Sustainable Energy Future" to an audience of high-ranking diplomatic representatives.

Sixty delegates were registered for the event, with a third of them being ambassadors. It began with welcome addresses from Norbert Pestka, Managing Director of the German-Norwegian Chamber of Commerce, and Carolin Oebel, Director of the IGU Secretariat. Then János Herman, EU Ambassador to Norway, and

Torstein Indrebø, IGU Secretary General, gave keynote speeches looking at the challenges facing the creation of a sustainable energy system and how they can be tackled. A panel discussion and questions from the floor followed.

The panel comprised Ambassador Dr Axel Berg of Germany, Svetlana Ozhegova, Minister Counsellor of the Russian Embassy, William Taliaferro, Deputy Political-Economic Counsellor of the US Embassy, Erik Johnsen, Deputy Director General of the Oil & Gas Department, Norwegian Ministry of Petroleum & Energy, and Torstein Indrebø. It was moderated by Gro Mjellem, General Manager of the Norwegian Petroleum Society, the Norwegian Charter Member of IGU.

Role of gas

The core message of the event was that immediate reductions in carbon emissions can be achieved by switching from coal and oil to natural gas, particularly in the power generation and transportation sectors, and improving energy efficiency. In the longer term, although a sustainable energy future demands major development of renewables, gas-fired power generation will be a vital back-up to intermittent wind and solar production.

"Access to energy is the key to economic development," said Torstein Indrebø, pointing out that demand will increase as the 1.3 billion people lacking access to electricity are connected and the world's population grows from 7 billion to 9 billion by 2050. "We need to provide energy in a less carbon-intensive way," he continued, "and gas has an important role to play in a future energy scenario."

► Torstein Indrebø: access to energy key to economic development.





◀◀ Norbert Pestka gave the opening welcome address.

◀ János Herman: gas-fired power stations support integration of renewables.

“Decarbonisation is economically feasible,” said Ambassador Herman, who briefed delegates on the Energy Roadmap 2050. This was adopted by the European Commission in December 2011 as the basis for developing a long-term policy framework to move the EU towards a low-carbon energy system while ensuring competitiveness and security of supply.

“The goal is for carbon emissions to be reduced to 20% of the level of 1990 by 2050,” explained Herman, “and the initial target is for 20% of total energy consumption to come from renewable sources by 2020.”

This figure is an average with each member state having an individual target. The current average for the EU is 12.4% with the share in member states ranging from a high of 46.9% in Sweden (whose 2020 target is 49%) to 0.3% in Malta (whose 2020 target is 10%).

“Gas-fired power stations support the integration of renewables,” said Ambassador Herman, “and carbon capture and storage (CCS) can be added.” The EU is supporting CCS demonstration projects although the six authorised to date have been for coal-fired plants.

Debate

In fact, coal-fired power generation in the EU’s largest economy, Germany, has been increasing as coal from the US has become available at low prices and in light of the fact that Germany

has decided to close down all nuclear plants within the next 10 years. There was a vigorous debate about the factors which have encouraged Germany to use more coal.

The US has cheap coal to export because it has been displaced in power generation by unconventional gas and Germany can burn more coal with a minimum penalty because of the low price of carbon in the EU Emissions Trading System. At the time of the symposium the price was €4 per tonne of CO₂ compared to a peak of €30 in 2006.

“The ETS price level is a concern and some corrective measures have been prepared,” said Ambassador Herman.

Ambassador Berg acknowledged the short-term switch to coal but pointed to Germany’s record on developing renewables and said the country now has 40 GW of installed renewable capacity.

William Taliaferro reviewed the tremendous growth in US production of unconventional gas, particularly shale, which has ushered in a new era of cheap and plentiful gas. He pointed out that the price differential with oil is encouraging greater use of gas in the US transportation sector, while the price differential with other regions is driving the development of LNG export projects.

Svetlana Ozhegova reviewed developments in Russia, the world’s second largest gas



► Gro Mjellem takes a question from the floor for the panel of (from left to right) Axel Berg, Svetlana Ozhegova, William Taliaferro, Erik Johnsen and Torstein Indrebø.

producer after the USA, which is seeking to increase sales to Asia to balance its traditional export focus on Europe. Noting the flexibility of being able to supply by pipeline or as LNG, she declared, “nothing can compare to gas”.

Torstein Indrebø looked at the scope for gas developments around the world. “Total long-term recoverable conventional gas resources are

more than 400 tcm,” he said, “with another 400 tcm of unconventional gas.”

Developing these resources demands major capital expenditure and delegates agreed on the need to create the conditions to encourage investment in the gas industry. “Energy security is not only about supply security but demand security is also important,” said Torstein Indrebø.

There was also general consensus that gas prices in the main regional markets would begin to converge. Indeed, Ambassador Herman hoped to see “the gradual development of a global market for gas”.

Summing up, Torstein Indrebø stressed the need to improve energy efficiency and substitute gas for more polluting fossil fuels, quick fixes which he described as “the low-hanging fruit”, in parallel with a long-term commitment to renewables backed up by gas. “In IGU we see gas as a long-term destination fuel,” he said.

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

► Axel Berg: Germany has 40 GW of renewable capacity.



From Chaos to Gas

By Hanne Thomsen



Hanne Thomsen.

"From Chaos to Gas" is the title of an exhibition at the Danish Gas Museum, a founder member of the Gas Historical Network. Chaos refers to the Greek origin of the word gas and to the situation before people found a way to use fossil fuels when there was one energy crisis after another.

Denmark entered the gas age in 1853 when the country's first gasworks started manufacturing gas from coal. Initially gas was used for street lighting but it soon found a wide range of uses in the commercial, industrial and residential sectors.

From the 1950s, manufactured gas started to be supplanted by imported propane and butane. In 1983, the Strandvejs gasworks was the last to close and the following year Denmark became a natural gas producer from its sector of the North Sea.

In the new exhibition at the Danish Gas Museum visitors can see a range of gas appliances which brought cleanliness, health and comfort to residential consumers. The appliances date back to various periods, the oldest being an English cast iron range from the 1860s and the newest being a natural gas boiler.

Visitors are shown how gas was produced from coal along with coke, coal tar and ammonia. Several items of equipment are on display together with a model of the Strandvejs gasworks as it was in 1943. They are also shown how the products were sold with a recreation of the office of the gasworks' manager, where deliberations about gas and coke prices, the market situation and future strategies took place. Here all information from the gasworks was gathered and distributed to customers and politicians.

The exhibition also includes a section about the introduction of gas into rural areas after World War 2, where bottled gas had the same civilizing influence in the 1950s and 1960s as town gas had had earlier.

The future of gas

The next stage in the Danish Gas Museum's project, which runs to 2014, is an exhibition about natural gas as a complement for new energies, showing the interaction between various types of energy now and in the future. It will have a section with laboratories and experiments to make it possible to experiment with the production and use of energy.

There will also be exhibitions on housing and building, transport, and the environment and pollution with a perspective ranging from a thousand years ago to the present, including all the things made possible in Europe by the enormous consumption of fossil fuels. Our hope is that the exhibitions will create a basis for deliberations about future energy supplies and the consequences for transport, housing and the environment.

Hanne Thomsen is the Curator of the Danish Gas Museum in Hobro, Denmark (www.gasmuseet.dk).

The Gas Historical Network (GHN) aims to link the world's gas museums and collections through www.gashistory.org and to provide information to the general public on the history of gas usage around the world. GHN mounted exhibitions at the 23rd and 24th World Gas Conferences with the generous support of the National Organising Committees. Options for WGC2015 are being considered.

■ CALL FOR EXPRESSION OF INTEREST

« Supply of Liquefied Natural Gas (LNG) »

On the basis of studies assessing the national Natural Gas supply security, the Government of the Republic of Côte d'Ivoire ("GoCI") has elected to procure additional supply sources beyond its domestic gas fields. The objective of this call for expression of interest is to identify companies which could provide the GoCI through the state-owned national hydrocarbon company PETROCI Holding, the following energy supply and/or financing:

1. With respect to energy supply (the "Supply")

- Delivery of Liquefied Natural Gas ("LNG");
- Supply requirements are estimated to amount to a minimum of 37 BCF/Year over a time horizon of 10 years renewable.

2. With respect to financing (the "Financing")

- Structure and provide an import financing facility backed by the LNG sales contract.

■ SUBMISSION PROCESS

Companies with appropriate experience in these fields are invited to register their interest.

NB: The application entitled "Prequalification Document" will be downloaded from PETROCI website: www.petroci.ci

The candidate submissions must be labeled:

To the Attention of the Managing Director of PETROCI Holding

"Expression of Interest for the supply of LNG to Côte d'Ivoire"

Four (04) copies of the submission shall be delivered in a sealed envelope no later than MAY 30th, 2013 at 5:00pm at the following address:

PETROCI HOLDING Mrs. TAPE LOKPO Edith 14 Boulevard Carde, Abidjan Plateau, Immeuble les Hévées, 9ème étage, porte 904 BPV 194 Abidjan, Côte d'Ivoire

Evaluation

A short list of candidates offering the best credentials will be established. These pre-selected candidates will then be invited to make both a technical and a financial offer in response to a competitive Request for Proposal (the "RFP"). The winning candidate(s) will be selected based on the selection criteria specified in the RFP.

Expression of Interest Inquiries

Candidates should consider the Call for Expression of Interest and request any required clarifications in writing not later than 3 days before the Due Date. All inquiries shall be submitted in writing to Mr ABROGOUAH Eddi, Technical Advisor of the General Manager in charge of Natural Gas matters at the following email address: rabrogouah@petroci.ci

The Office of the Managing Director

Daniel GNANGNI

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Presenting IGU's New Members

At the Council meeting in Ottawa in October 2012, IGU welcomed four new Charter Members from Albania (Energy Regulatory Authority, ERE), Azerbaijan (State Oil Company of the Azerbaijan Republic, SOCAR), Colombia (Naturgas, Asociación Colombiana de Gas Natural) and Côte d'Ivoire (Société Nationale d'Opérations Pétrolières Côte d'Ivoire, PETROCI), and Repsol as a new Associate Member.

Albania

By Shkelqim Bozgo

The Albanian Energy Regulator (ERE) was established in 1995 to cover the electricity sector. Under the Natural Gas Law of 2008, its scope was expanded to cover the gas sector. ERE is now working on the development of a regulatory framework in coordination with developments in the Energy Community and the EU area.

Natural gas was discovered in Albania in 1968 and production peaked in 1982 with

nearly 1 bcm/year. Five hundred wells have been drilled and cumulative production, including associated gas slightly exceeds 13 bcm. Until 1990, when production dropped significantly, gas was used mainly by the chemical fertiliser, oil and power generation industries with very limited use in the residential sector.

Albpetrol, the state oil and gas company has a pipeline system of some 400km, which is currently in a poor technical condition, while the company itself is now being privatised.

Albania's national energy strategy foresees an important future role for natural gas in the country's energy balance. Annual demand is forecast to grow from 0.3 to 1.2 bcm within a decade of new supplies coming online. Power generation will account for the main share of gas consumption, and demand is expected to increase gradually in the industry and residential sectors.

There are three options for new gas supplies: importing pipeline gas via connections to the regional and European transmission networks; importing LNG via a new regasification terminal on the Adriatic coast; and finding new domestic sources (exploration activity is underway).

Albania is a Contracting Party to the European Energy Community Treaty whose signatories have agreed to implement the EU *acquis communautaire* on electricity, gas, the environment, competition, energy efficiency and renewables with a view to creating a regional gas and electricity market in south-east Europe.

Albania and the other Western Balkan countries in the Energy Community are facing increasing energy security and environmental challenges. While each country's individual natural gas demand is small, together the

▼ Albania supports the creation of an Energy Community Natural Gas Ring of which the Trans Adriatic Pipeline (TAP) would form part. Albania could also be connected to the proposed Ionian Adriatic Pipeline (IAP) and Western Balkan Ring (WBR).



region can establish gas-fired combined-cycle power stations as initial anchor loads for an Energy Community Natural Gas Ring.

The Trans Adriatic Pipeline (TAP) project, which aims to transport Azerbaijani natural gas from the Turkish/Greek border via Albania to Italy, represents an excellent opportunity for Albania and the region. As well as supplying Albania with gas, TAP would interconnect the Italian and Greek markets and create the basis for the development of the Gas Ring. TAP would also foster the development of important underground gas storage capacities (up to 2 bcm) in Albania's salt domes and depleted fields.

The TAP joint venture company has applied for an exemption from third party access rules and regulated tariffs, and this is being reviewed jointly by ERE, Greece's Regulatory Authority for Energy (RAE) and Italy's Regulatory Authority for Electricity and Gas (AEEG).

ERE sees the exchange of knowledge and experience as important benefits of IGU membership as Albania develops its gas industry.

Shkelqim Bozgo, Commissioner, Albanian Energy Regulator (www.ere.gov.al).

Azerbaijan

By Rovnag Abdullayev

SOCAR, the State Oil Company of the Republic of Azerbaijan is a leading player in the energy industry with representative offices and trading companies in some 15 countries. The company was founded in September 1992 on the basis of the industry structures operated from the middle of the 20th century in the former Soviet Union. SOCAR's activities cover the complete value chain from exploration and production, processing, storage and transportation, to marketing and supply of oil, gas, petroleum and petrochemical products to domestic and international markets.

Azerbaijan's gas strategy is based on the principles of diversification, stability and security of supply. The country has estimated

gas reserves of 2.55 tcm and produces 27 bcm a year, of which 15 bcm is sold and 12 bcm re-injected. Annual production is expected to rise to 50 bcm by around 2025. Some 16 bcm/year of the additional production will come from phase two of the Shah Deniz development, which represents a major investment of more than \$25 billion. Development of other prospective structures including Absheron, Umud, Nakhchivan and Shafaq-Asiman is planned in the near future.

Natural gas is currently exported to Turkey, Russia, Georgia and Greece, and export markets will be further developed. The country's main objective is to have the Southern Gas Corridor established and operational as soon as possible. This corridor will comprise a series of linked pipelines including, but not limited to, the Trans-Anatolian Gas Pipeline (TANAP), TAP and Nabucco. SOCAR is heavily involved in the realisation of this project.

As well as increasing production and developing transportation projects to supply Azerbaijani gas to new export markets, there is also an opportunity for Azerbaijan to be a transit country for gas produced elsewhere in the Caspian region.

Energy safety, global climate change and contamination of the environment are among

▼ SOCAR's activities cover the complete value chain from exploration and production to marketing and supply.



the main issues SOCAR is focusing on. The company and its associates are working to improve the efficiency and safety of natural gas production, transportation and utilisation, and follow a strict environmental policy. This includes the elimination of inherited problems, the application of rules and standards in all spheres of work and the support of projects with high environmental and socio-economic returns.

SOCAR sees membership of IGU as providing an excellent networking opportunity and the chance to share information and best practices with specialists around the world. SOCAR intends to participate actively in IGU committees.

Rovnag Abdullayev is the President of SOCAR (www.socar.az).

Colombia

By Eduardo Pizano

Probably there has not been a more successful gas development programme than the one Colombia has implemented since the early 1990s. In 20 years, natural gas has achieved a 24% share of primary energy consumption. Today, the country produces 1 bcf/day (28 mcm/day), with 80% consumed domestically and

20% exported to Venezuela. Six and a half million homes are connected to the gas grid, more than 3,500 manufacturing companies use gas as their energy, 400,000 vehicles have been converted to CNG and an important number of thermal electric plants use gas as their feedstock.

This continued growth has been possible thanks to:

- ◆ An adequate policy, which includes a constitutional and legal framework, by which private companies provide the service, regulation is in the hands of a Regulatory Commission and supervision is provided by a government Superintendent's office;
- ◆ An active and stable government energy policy, which promoted the development of the natural gas market, the construction of the infrastructure and the availability of natural gas;
- ◆ The involvement of the private sector in all phases of the business: exploration, production, transportation and distribution, which has been able to allocate the resources to develop the necessary infrastructure;
- ◆ Collaboration of the regional and local government authorities, facilitating the construction of the gas grid and supplying

► Metroplús S.A. in Medellín, Colombia's second city introduced a fleet of CNG-fuelled buses operating on dedicated busways in December 2011.





Being vertically integrated, SOCAR is heavily expanding its activities across the whole value chain of upstream and downstream gas activities.

The company is maintaining a continuous growth and development path through investments in expanded capacity and the modernisation of existing assets.

SOCAR is involved in large projects such as Shah Deniz, ACG and other fields in Azerbaijan, the expansion of the SCP pipeline, the construction of the TANAP gas pipeline in Turkey, further gas pipelines into the EU (NW and TAP) and other projects in Switzerland, Singapore, UAE, Romania, Ukraine, etc.

Also more generally, the group is expanding its global presence with representative offices in Georgia, Turkey, Romania, Ukraine, Austria, Germany UK, USA etc.

SOCAR stands for the advancement of Azerbaijan's gas industry on a world scale, including national, European and international markets.



additional resources to subsidise the cost of the connections of low income families;

- ◆ Lastly, a national policy to provide additional subsidies in the cost of installations and of the gas price, focused on poorer families: 66% of residential installations are in the homes of low- and middle-income families.

Now that most of the residential and industrial market has been connected, there are greater challenges ahead. We are pursuing opportunities with CNG and LNG in trucks and buses. We already have a large sales network, with more than 651 CNG stations, all around Colombia. The city of Medellin, with the support of one of our affiliates, decided to use natural gas to fuel their new bus rapid transit system. It has been a success. With the increased savings and the adequate operation of this project, we expect to repeat this alternative in other cities of the country. Likewise we are advancing with a pilot programme with LNG for the trucking industry in Colombia. With the development of motor engines fitted for this use, we see great opportunities in this market.

We see large possibilities in cogeneration of electricity in association with manufacturing plants. We provide a clean fuel, which combined with the energy from manufacturing is an excellent alter-

native to provide electricity at a rational cost.

All of the above has been possible because of a friendly business environment, where the government has guaranteed an adequate regulatory framework, which has permitted the private sector to dedicate enormous economic resources to provide the gas, construct the infrastructure and develop the market. With our affiliation to IGU we expect to share all our experiences and acquire new ones from other markets.

Eduardo Pizano is the President of Naturgas (www.naturgas.com.co), the trade association for the natural gas sector in Colombia.

Côte d'Ivoire

Société Nationale d'Opérations Pétrolières Côte d'Ivoire (PETROCI) was established in 1975 to explore for and produce oil and gas in Côte d'Ivoire. In 2011, the country produced 12.4 million b/d of oil and 1.6 bcm of gas, while PETROCI had sales of \$443.35 million and net income of \$69.44 million.

Developing the gas industry in Côte d'Ivoire will help to foster economic development and reduce social inequalities. PETROCI wants to:

- ◆ Promote the technical and economic progress of the gas industry;

► Côte d'Ivoire's largest producing natural gas field is the offshore Foxtrot field.



- ◆ Work towards improving the competitiveness of gas in the country's energy market;
- ◆ Promote all activities along the entire gas chain;
- ◆ Encourage R&D into new and better technologies for gas use;
- ◆ Promote the safe production, transmission, distribution and utilisation of gas;
- ◆ Enhance partnerships with industry and manufacturers, and cooperation with governments, policymakers and international energy-related organisations;
- ◆ Promote the exchange of information with other bodies to help improve the efficiency and safety of gas operations.

Gas demand in Côte d'Ivoire has the potential to increase to 13 bcm/year in the second half of the decade of which the mining sector would consume 52%, power generation 28%, industry and transportation 12% and the upstream sector 8%.

PETROCI's strategy is to develop marginal fields, start LNG imports in 2015 via an FSRU and connect to the West African Gas Pipeline in the longer term to meet the government's vision of making Côte d'Ivoire a regional energy hub.

PETROCI seeks to learn from the experience of current IGU members, and would also like to help develop cooperation between IGU and countries of the sub-region.

For more information, visit www.petroci.ci.

Repsol

By Jorge Gómez de la Fuente

Repsol is an international oil and gas company with activities throughout the gas industry: E&P, refining, chemicals, LPG, marketing, trading and LNG. Repsol is headquartered in Spain and the company has operations worldwide with an active presence in five continents.

E&P activities take place in 32 countries (with Repsol as operator in 23). In 2011, Repsol's hydrocarbon production (excluding YPF) stood

at 298,721 boe/d and proven reserves totalled 1,167 million boe of which 66% was gas.

Repsol has a sustained proven reserves replacement ratio greater than 110% (162% in 2011).

LNG activities are located in Trinidad and Tobago with an average 23% working interest in the four liquefaction trains plus off-take; in Peru with a 20% working interest in the liquefaction plant and with 100% of the off-take; and in Canada with a 75% stake in the Canaport regas terminal.

Downstream activities include: six refineries (five in Spain with a total processing capacity of 896,000 boe/d and one in Peru with 102,000 boe/d); 4,506 service stations (in Latin America, Spain, Portugal and other European countries); the world's fourth largest LPG operations; and chemicals production totalling 2,858 tons/year. Repsol also has a 30% stake in Gas Natural Fenosa, which provides additional gas, downstream and power generation positioning around the world.

Repsol is involved in the entire gas industry value chain: E&P, midstream and marketing including both pipeline and LNG as transport modes for supplying different global markets. Apart from Repsol's experience in developing and operating its current gas assets, the com-

▼ Repsol has E&P activities in 32 countries including Algeria.



pany has a strong portfolio of gas discoveries and acreage that represents an important exploration, production and development potential for new gas projects.

Additionally, Repsol is investigating, within its R&D centres and also in partnership with other oil and gas companies and universities, new technical solutions for gas monetisation, such as floating liquefaction/regasification solutions, small-scale developments, deepwater piping systems, new uses/market niches and new ways of transportation for natural gas (including gas hydrates).

Within Repsol's strategic plan, four out of the 10 key growth projects are gas related, in Algeria (Reganne), Peru (Kinteroni), Venezuela (Cardon IV) and Bolivia (Margarita – Huancaya); while gas activities form an integral part of the Brazilian projects (also part of the key growth strategy).

From Repsol's perspective, IGU is one of the leading forums that promotes the gas industry and disseminates trends and experiences from many of the leading gas companies and entities

(IOCs, NOCs, technologists, contractors, regulators, national entities, service companies, etc.); in addition, IGU covers all the gas industry value chain activities (technical, commercial, contracts, legal, marketing, geopolitical forums, and others). With this leadership, we see that IGU has become an important vehicle for collaboration in all aspects of the gas industry and, therefore, Repsol would like to increase its involvement in IGU's activities.

Repsol has a long track record of participation in IGU's committees and triennial work programmes, and chairing/co-chairing sessions in the World Gas Conferences. Following this sustained collaboration, Repsol would like to strengthen its position in IGU by having access to all the programmes developed, providing more participation by experienced professionals and would very much like to provide input for the definition of topics and in IGU's decision making forums.

Jorge Gómez de la Fuente is LNG Projects Portfolio Manager of Repsol (www.repsol.com).

► Repsol's LNG activities include a stake in Atlantic LNG in Trinidad.



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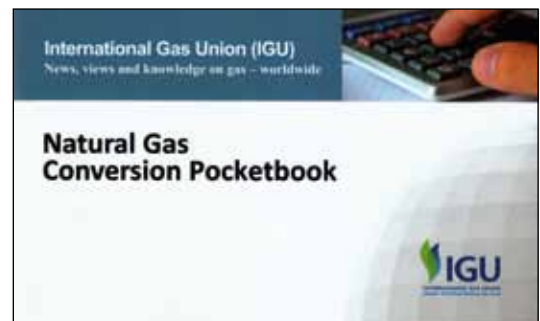
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Publications and Documents Available from IGU

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 to order hard copies (if in stock) from the Secretariat:

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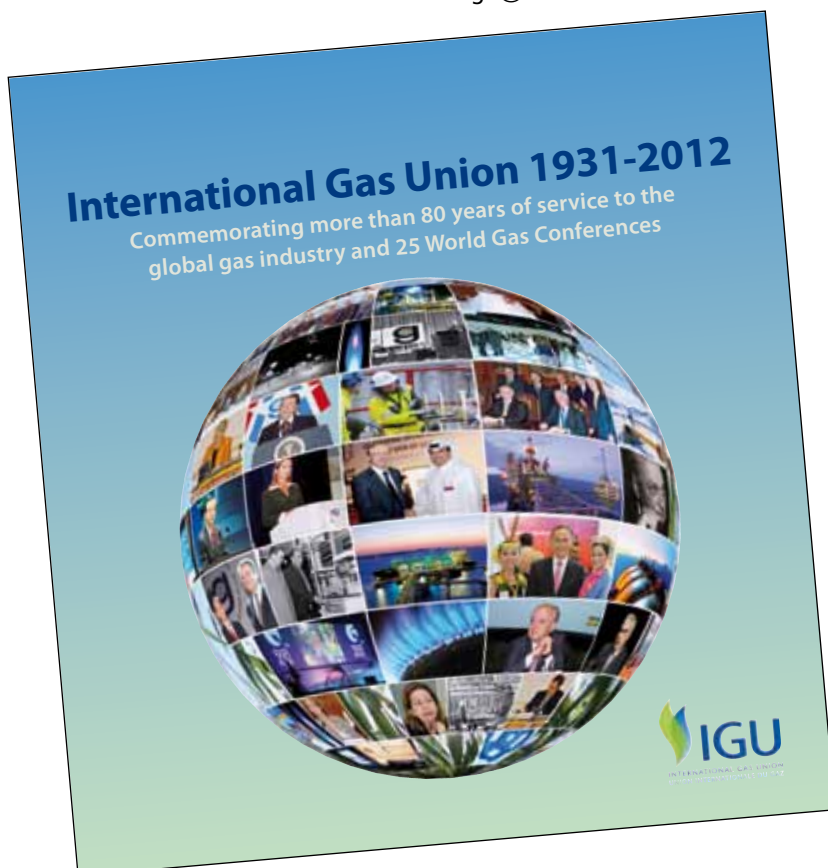


IGU publications

- ◆ IGU Articles of Association
- ◆ IGU Annual Report
- ◆ IGU Strategic Statement
- ◆ IGU General Brochure
- ◆ Triennial Work Programme 2012-2015
- ◆ 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 Change
- ◆ Natural Gas as a Transportation Fuel
- ◆ Natural Gas Unlocking the Low-Carbon Future
- ◆ World LNG Report 2011
- ◆ Wholesale Gas Price Formation – A Global Review of Drivers and Regional Trends

Reports for WGC2012

- ◆ Final report of the 25th World Gas Conference
- ◆ Best Practices and IGU Awards
- ◆ Building Strategic Human Capital
- ◆ Everything You Wanted to Know about Gas ... but Were Afraid to Ask (Youth publication)
- ◆ Geopolitics and Natural Gas
- ◆ Natural Gas Industry Study to 2030: An Update on Supply, Demand and Trade



- ◆ Nurturing the Future Generations for the Oil and Gas Industry
- ◆ Reduction of Greenhouse Gases: A Technology Guide
- ◆ Renewable Gas: The Sustainable Energy Solution

Special IGU publications for WGC2012

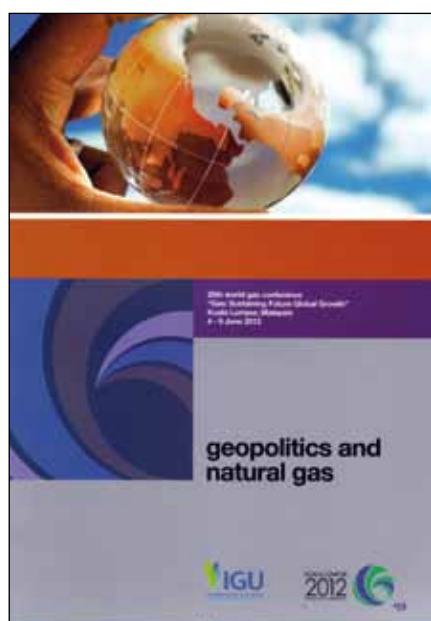
- ◆ Global Vision for Gas: The Pathway towards a Sustainable Energy Future
- ◆ IGU Natural Gas Conversion Guide
- ◆ IGU Natural Gas Conversion Pocketbook
- ◆ International Gas Union 1931-2012
- ◆ Shale Gas: The Facts about the Environmental Concerns
- ◆ World LNG Report – 2011

Joint publications with other organisations

- ◆ The Role of Natural Gas in a Sustainable Energy Market (with Eurogas)
- ◆ Guidebook to Gas Interchangeability and Gas Quality 2011 (with BP)

Scientific and technical papers and documentation

- ◆ Sustainable Development and the Role of Gas (2006)



- ◆ Gas to Power Global Outlook, (2006)
 - ◆ The Art of Regulation, (2006)
 - ◆ Proceedings of the 23rd World Gas Conference, 2006, (CD-ROM)
 - ◆ Proceedings of the 22nd World Gas Conference, 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
- Please check the IGU website for other (older) publications which are still available from the IGU Secretariat.

IGU Events and Other Major Gas-related Events 2013-2015

2013

April 9-11 IGU Executive Committee Seville, Spain

April 16-19
LNG 17
Houston, USA

May 22-23
First European Retreat of the
World Shale Series
Bruges, Belgium

May 30-31
European Gas Technology Conference
(EGATEC 2013)
Paris, France

June 24-26
World Shale Gas: Asia-Pacific
Singapore

September 23-27
IPLOCA 47th Annual Convention
Washington DC, USA

October 13-17
22nd World Energy Congress
Daegu, Korea

October 22-25 IGU Council Meeting Beijing, China

November 4-7
World Shale Gas Conference &
Exhibition
Houston, USA

November 9-11
Second Latin American Summit of
the World Shale Series
Buenos Aires, Argentina

November 11-22
19th Session of the Conference of
the Parties to the UNFCCC (COP 19)
Warsaw, Poland

2014

March 24-27
Gastech Conference & Exhibition
Seoul, Korea

April 1-3 IGU Executive Committee Brisbane, Australia

June 15-19
21st World Petroleum Congress
Moscow, Russia

September 17-19 IGU Research Conference IGRC 2014 Copenhagen, Denmark

October 14-17 IGU Council Meeting Berlin, Germany

November 19-21
GASEX 2014 Conference & Exhibition
Hong Kong, China

2015

March 24-26 IGU Executive Committee Cairo, Egypt

June 1 IGU Council Meeting Paris, France

June 1-5 26th World Gas Conference Paris, France

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Cover: Woodside Energy (Pluto LNG plant and worker), Grain LNG (LNG tanker), Vos Logistics (LNG-fuelled truck).

Messages: French Presidency of IGU (10), BASF (11), IGU (14 & 15 lower), UN Photo/Eskinder Debebe (15 upper).

IGU Members and Organisation: Canadian Gas Association (24), French Presidency of IGU (Jérôme Ferrier & Georges Liens, 25), GTI (David Carroll, 25), MGA (Datuk Abdul Rahim Hashim, 25), IGU (Mel Ydreos & Torstein Indrebø, 25).

News from the Secretariat: All IGU except p36 (CWC Group) and p37 upper (IEF www.ief.org).

First Assignments for IGU's New President: FSB Comunicações (44 & 45), IEE Communications (46).

First Council Meeting of the 2012-2015 Triennium: Canadian Gas Association.

Gas Recognised as a Destination Fuel at 3rd Ministerial Gas Forum: IGU.

News from Organisations Affiliated to IGU: EDI (68 & 69), GTI (72), Cyril Becquart/GDF Suez (73), IPLOCA (75 & 76), David Perry/NGV Global (79).

Imagine Gas Innovation: Danish Gas Technology Centre (82 & 83 lower), Marcogaz (83 upper).

Be Inspired in Copenhagen: Tivoli Congress Center (85 upper), Danish Gas Technology Centre (85 lower).

Countdown to the 26th World Gas Conference: French Presidency of IGU (88 upper left & right), Jean-Claude Guilloux/Viparis (88/9 lower & 89 upper), Palais des Sports (90).

Progress Report: All IGU except p127 (Canadian Gas Association).

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COP 18 Delegates Agree Doha Climate Gateway: International Institute for Sustainable Development (IISD) Reporting Services.

Recent Developments in Gas Pipeline Inspection and Integrity Management Technology: Rolls-Royce plc (174), TransCanada Pipelines Ltd (177 upper), Rosen Group (177 lower), Nord Stream AG (178), Gas Energy News, Japan (180), Galsi (184), South Stream (185).

Slovakia Celebrates Transmission Anniversaries: Slovak Gas and Oil Association.

Addressing Skills Shortages – a Case Study from Tunisia: ETAP.

Securing the Golden Age of Gas: OECD/IEA.

Reports from the Regional Coordinators: Kogas (196), GasTerra (197).

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Global Vision Symposium in Oslo: IGU.

From Chaos to Gas: Danish Gas Museum.

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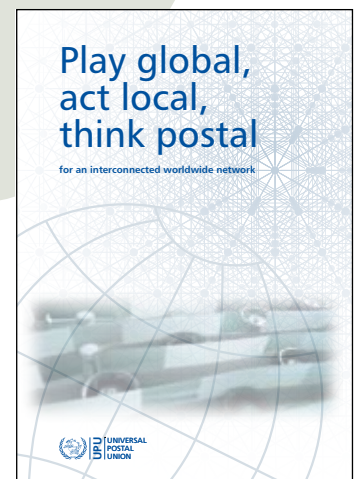
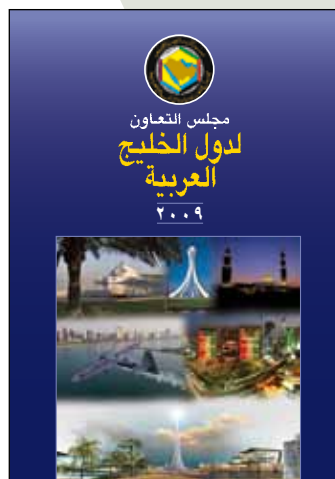
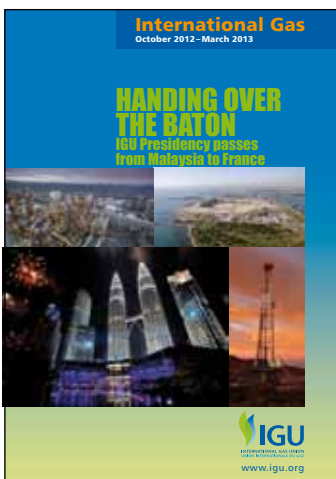
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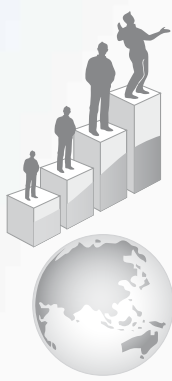
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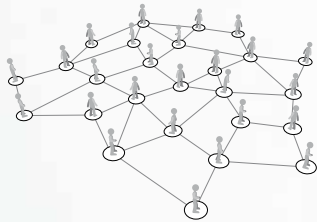
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