International Gas

April – September 2015

GAS INDUSTRY MEETS IN PARIS

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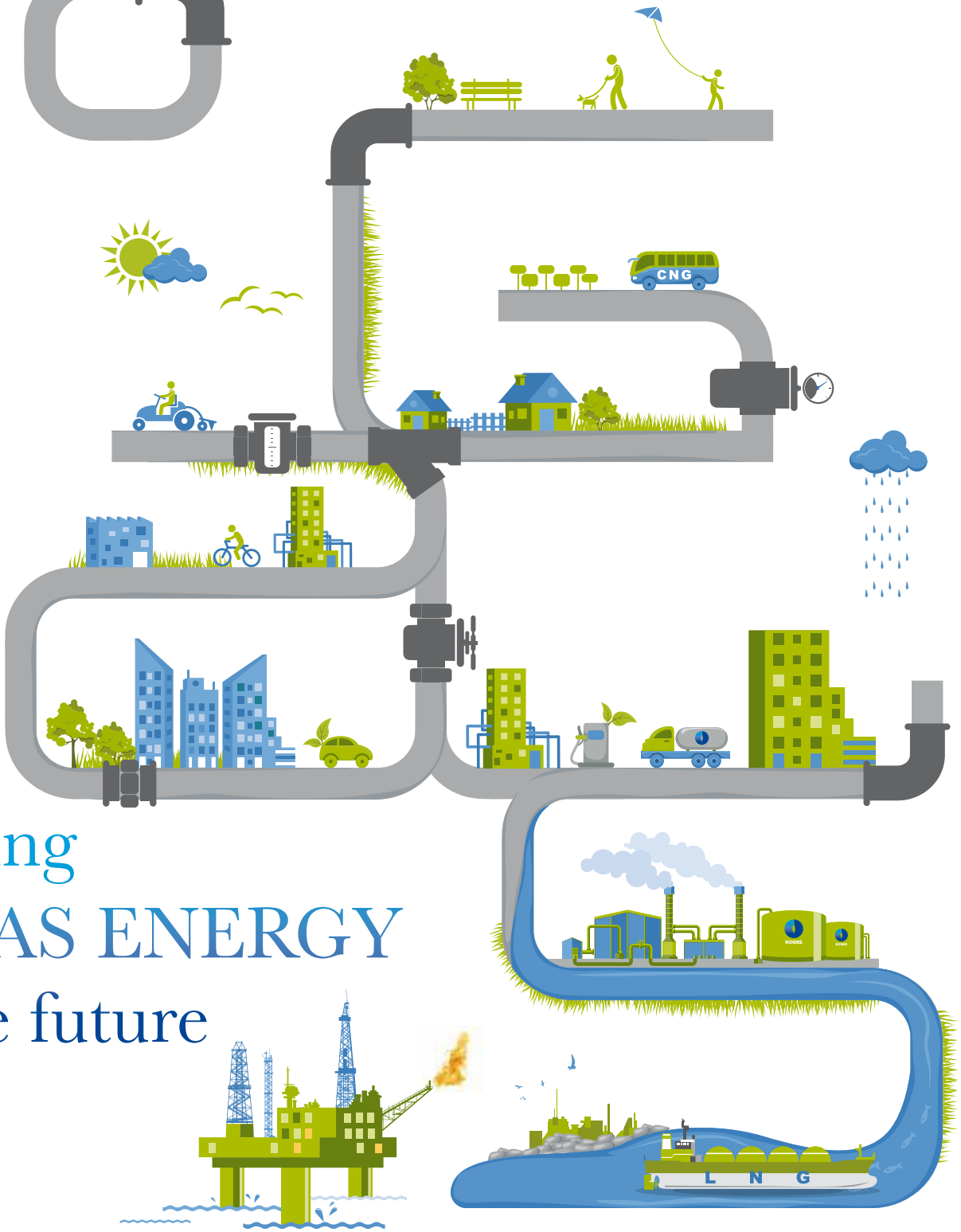

Creating KOGAS ENERGY for the future

International Gas

APRIL – SEPTEMBER 2015

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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 97% 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.

Gas Natural Fenosa and Sedigas, proud Hosts of the IGU Secretariat 2016-2022

Barcelona, Spain

Gas Natural Fenosa and Sedigas will be proud **Hosts of the Secretariat of the International Gas Union** for the **2016-2022** period. We are committed to promoting the gas industry around the world, with flexibility and proximity. Based in Barcelona, a strategic location in the natural gas market and a pioneering city in the use of this energy. **Welcome.**

sedigas

gasNatural fenosa

Energy and economic growth for the world

Global energy demand is expected to be about 35 percent higher in the year 2040 than it was in 2010. Natural gas will continue to 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. As one of the world's largest producers of natural gas, ExxonMobil is committed to developing this important resource. Because it's more than just a business opportunity … it's an investment in the future.

ExxonMobil

Contents

April – September 2015


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Message from the President

Dear Colleagues

Last year was one of contrasts for the energy world.

It was a particularly warm year, so much so that 2014 has been labelled the "year of the century" for its record temperatures and the knock-on effect this had on gas consumption – particularly for heating purposes.

▼ Jérôme Ferrier takes the floor at the 4th St Petersburg International Gas Forum in October 2014.

There was also much political and economic tension in 2014, which affected energy markets, causing oil prices to plunge during the last quarter of the year.

However, natural gas still managed to confirm its position as the fossil fuel of the future. According to the International Energy Agency (IEA), natural gas is due to experience its most robust growth over the next few years.

Work will continue as planned on projects that have reached the final investment decision (FID) point, although projects awaiting FID may well be put on hold for the time being.

This should not, however, jeopardise natural gas growth prospects. Natural gas will slowly continue to replace coal and oil to become the fossil fuel of the future. It is the only fuel capable of supporting the growth of renewables, which we hope will protect our planet from climate change.

IGU strengthened its activities in this field last year, further consolidating its relations with governmental organisations. We signed a memorandum of understanding in September with the World Bank and developed promising exchanges with UNFCCC, UNIDO and UNESCO.

During the second half of 2014, I promoted the voice of gas at a range of notable events, speaking at gas industry regional and international conferences in Abuja, Acapulco, Berlin, Beijing, Copenhagen, Dallas, Hong Kong, St Petersburg and Singapore.

I would like to highlight the 4th Ministerial Gas Forum organised by IGU and IEF in Acapulco in November. This was chaired by the Mexican Secretary of Energy, HE Pedro Joaquín Coldwell in the presence of HE Ali bin Ibrahim Al-Naimi, the Saudi Arabian Minister of Petro-

Jérôme Ferrier addressing the 4th IEF-IGU Ministerial Forum which was held in Acapulco, Mexico in November 2014.

leum and Mineral Resources, and attracted 120 participants. It was an opportunity to prepare for the G20 meetings, at which gas is increasingly being positioned as the best source of energy for economic development.

Strong results of the 2012-2015 Triennium

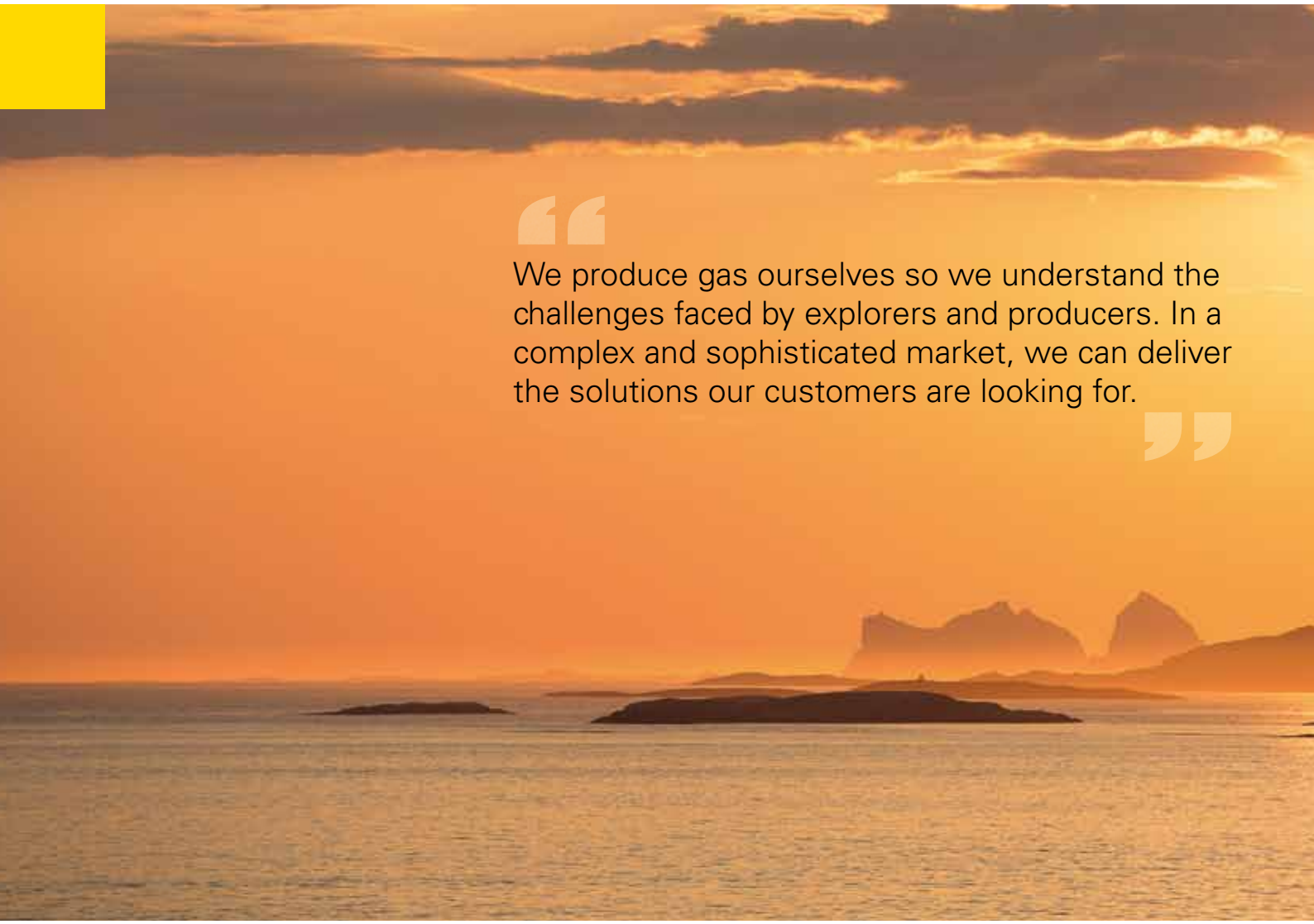
The whole IGU team can be proud of the results obtained during the 2012-2015 Triennium under the French Presidency, which will hand over to the USA for the 2015-2018 Triennium in June. We have seen a record growth in IGU's membership to the current 91 Charter and 51 Associate Members. We have developed stronger relationships with other international organisations, as I outlined earlier, while our new web portal designed to support the Global Voice of Gas has strengthened communications promoting the benefits of natural gas. In addition, our "Building for the Future" project should provide IGU with the resources it needs to develop activities and implement measures on an international level.

The highlight of the triennium will be the 26th World Gas Conference in Paris from June 1-5, which we will use to showcase the importance of natural gas to the global energy community. This major event, which focuses on Gas and Sustainable Development and comes just six months before the COP 21 Climate Change Summit in Paris, is an ideal opportunity for us to accentuate the qualities of natural gas and how it can support the growth and development of future generations.

Jérôme Ferrier

Jérôme Ferrier addressing the 5th World Shale Oil & Gas Summit which was held in Dallas, USA in November 2014.

A world leader in energy supply



We produce gas ourselves so we understand the challenges faced by explorers and producers. In a complex and sophisticated market, we can deliver the solutions our customers are looking for.

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Paul Reed, CEO
BP Integrated
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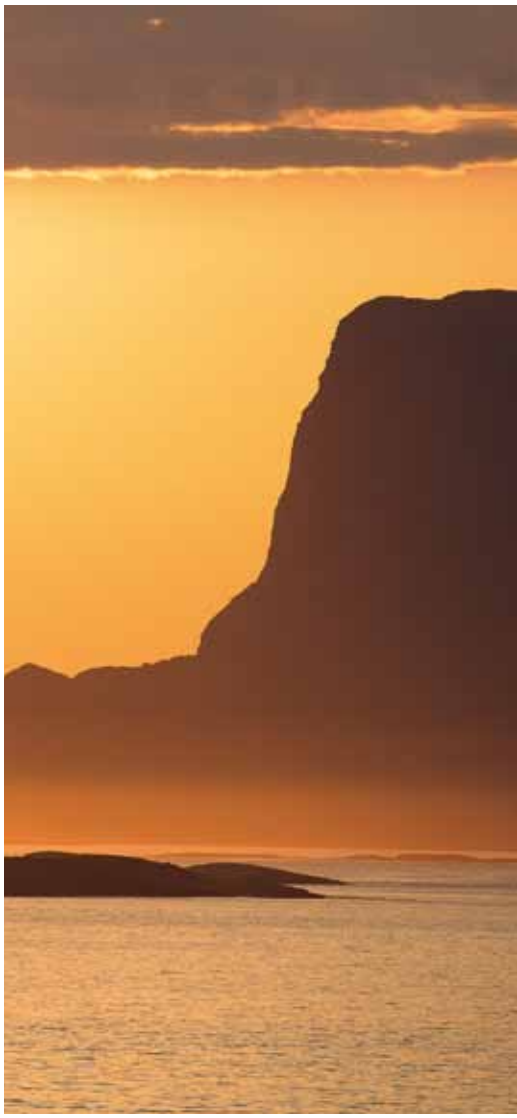

We are one of the world's leading international oil and gas companies. We provide fuel for transportation, energy for heat and light, retail services and petrochemicals products. Our activities include oil and natural gas exploration, field development and production, midstream transportation, storage and processing, and the marketing and trading of natural gas, including LNG, together with power and natural gas liquids.

Our size and global reach are important. But we believe that ultimately success comes from the energy of our people and the strength of the relationships we build.

Adding value right across the supply chain

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Message from the Secretary General

▲ Pål Rasmussen, Secretary General.

Dear Reader

Gas is building the future.

IGU has a unique position in the global gas industry; this position has developed over decades of dedicated work by presidencies and secretariats with the support of the IGU members and committees. IGU has served and will serve the global gas industry according to its vision, mission and objectives. It will lead the way towards lower emissions and contribute to a long-term sustainable energy mix in which natural gas and renewables will play key roles.

The committees are the cornerstone of our Union and distinguish us from other organisations in our field. The fact that we represent the whole gas value chain puts IGU in a position which attracts decision makers and other important opinion formers. My message to the committee chairs is that your deliverables, and the quality of these, are of the highest importance to the Union as we move forward.

It is also important that there is an open dialogue between the committee chairs to ensure the overall quality of the deliverables from the Coordination Committee. I had the pleasure of joining the meeting for incoming committee chairs in Washington DC in January, and it was inspiring and encouraging to meet this highly motivated team. Good and coordinated deliverables from the committees will serve all elements of our advocacy programme, whether it is the Global Gas Portal, the IGU magazine, the IGU newsletter, IGU reports or our general daily work.

Initiatives

From having the main focus on the gas industry, IGU has taken steps lately which involve us in the whole energy industry. We participate in forums discussing all energy sources and related issues of health, climate change, different aspects of development, security of demand and supply – the list is long.

Over the last decade there have been many initiatives in this direction, but the turning point in my mind was the cooperation with the G20 and signing a Memorandum of Understanding (MoU) with the World Bank. Looking on these relationships individually does not reveal the importance of them as a whole. They are door openers, and the reason we are now in the middle of discussions about numerous MoUs.

We will present an MoU strategy at the Executive Committee meeting in Abu Dhabi, but already at this stage I can list some of the organisations we are talking to: UNECE, UNFCCC, UNEP, SE4All, IPI, UNIDO and UNESCO. My ambition is for IGU to be in a position to sign between four and six MoUs by the end of the 26th World Gas Conference in Paris in June to position the Union for the future. These cooperation agreements are important for many reasons, notably because they are a fantastic opportunity to advocate for and raise the voice of gas, and give IGU a seat at the table of decision makers.

Communication and advocacy for gas will be a key factor in the coming years. Our industry is well developed technologically and there is a strong focus on

research and development, both to increase energy efficiency and to reduce emissions, but we must continue to raise our voice for gas. As I write there are hearings around the world on the agreement to be signed during the COP 21 Climate Change Summit in Paris later this year. All our members should engage in these hearings on a local level, to influence your own decision makers and ensure that each country will argue for natural gas to be a part of the long-term, low-carbon energy future. But IGU as a whole also needs to engage on the communications front, and we have initiated important steps here. Let me give you a few examples:

- The Global Voice of Gas project;
- A communications strategy to ensure common messaging in IGU;
- Extend cooperation agreements with key external organisations;
- IGU conferences and participation in other key events.

Regarding the Global Voice of Gas project we demonstrated the effectiveness of the tool last autumn when it was used to target the launch of the World Energy Outlook report from IEA. We saw the effect of a proactive approach of targeting an event, with a clear statement from IGU and follow-up towards the media. We obtained good coverage in global media, and also a positive response from the industry. The tool is looking very promising and will, in combination with appropriate resources, be a success that will ensure IGU's role as the spokesperson of the gas industry worldwide.

Conferences

Our conferences are improving, we see increased numbers in participation and quality, and a lot of good work has been carried out. In the second half of 2014 we delivered two highly professional and well-received events with IGRC in Copenhagen and the Ministerial Gas Forum in Acapulco. Our next event is the 26th WGC in Paris.

There are no global events that can compare to the triennial WGC, which is where all the senior representatives of the industry meet. The French team is well prepared and registration numbers are increasing. This event will bring the successful French triennium to an end, and on the last day of the 26th WGC the IGU Presidency will be handed over to United States. I am looking forward to meeting you all in the beautiful city of Paris.

We are presently looking into the way we organise our overall conference portfolio. We will raise questions such as: How will the relationship between IGU and the host develop for future events? How can we improve the branding of the portfolio in the future? The conferences are becoming increasingly important to IGU from a financial point of view, and we need to ensure there is minimal risk involved for IGU, and that we serve the industry in the best way possible.

So as you see we are well on our way to building the future of IGU, through:

- Motivated committees which will contribute and deliver;
- New cooperation agreements which increase the influence of IGU;
- Stronger and more uniformed messaging from IGU;
- Global Voice of Gas project;
- Approach our conference portfolio.

All of this is important to support our members in the global gas industry, and I hope that IGU will continue to deliver and enjoy the support of the industry into the future.

Let us build the future of gas together!

Pål Rasmussen

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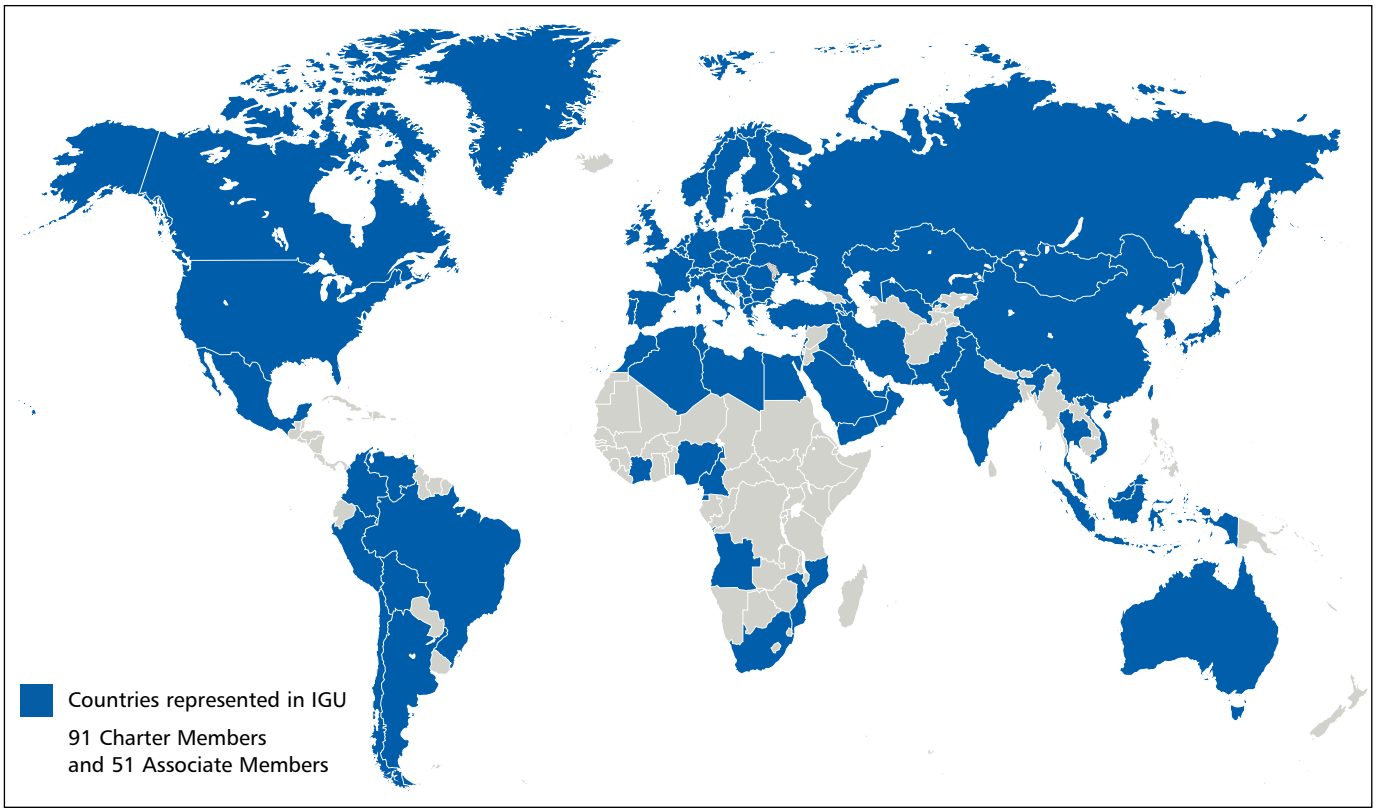

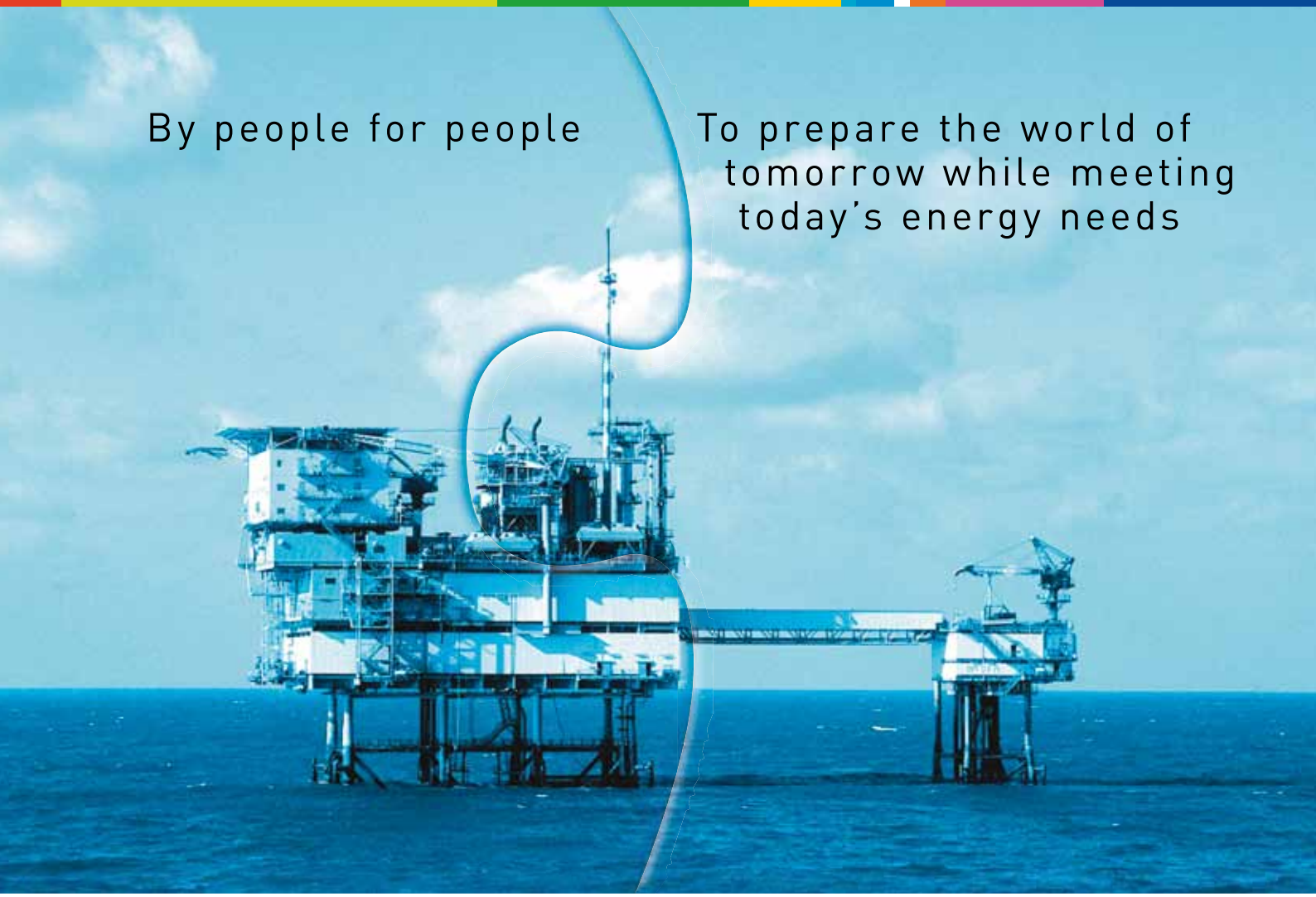

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*A barrel of oil equivalent (or "boe") is a unit of measurement used to compare the energy value of (non-liquefied) gas to that of crude oil.
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Egyptian Gas Association

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IGU Organisation 2012–2015

IGU Executive Committee

Mr Abdelhamid Zerguine, Algeria

Mr Javier Gremes Cordero, Argentina

Ms Cheryl Cartwright, Australia

Mr Augusto Salomon, Brazil

Ms Lixin Che, China

Mr Timothy M. Egan, Canada

Mr Mel Ydreos, Canada

Mr Jean Schweitzer, Denmark

Mr Jérôme Ferrier, France

Mr Georges Liens, France

Mr Gerald Linke, Germany

Mr Kyoji Tomita, Japan

Mr Jae-Seob Kim, Republic of Korea

Datuk (Dr) Abdul Rahim Hj Hashim, Malaysia

Mr Gertjan Lankhorst, The Netherlands

Mr Runar Tjersland, Norway

Mr Paco Freens, Qatar

Mr Andrey Sapozhnikov, Russia

Mr Pavol Janočko, Slovak Republic

Mr Antoni Peris Mingot, Spain

Mr David Carroll, United States of America

Hon. Dave McCurdy, United States of America

Mr Xia Yongjiang, China National Petroleum Corporation, Associate Member

Ms Valérie Ruiz-Domingo, GDF Suez, Associate Member

Mr Chris Gunner, Shell, Associate Member

Mr Khaled Abubakr, TAQA Arabia, Associate Member

Ms Cynthia Silveira, IBP, Associate Member

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

Mr Marcel Kramer IGU Regional Coordinator for the Russia-Black Sea-Caspian area

Mr Pål Rasmussen, IGU Secretary General

This photograph was taken at the Executive Committee (EXC) meeting which was held in Berlin, Germany, in October 2014.

From left to right in the front row are Pål Rasmussen (IGU Secretary General), Datuk (Dr) Abdul Rahim Hj Hashim, Jérôme Ferrier, David Carroll and Torstein Indrebø (Honorary Secretary General).

In the next row are Georges Liens, Mel Ydreos, Antoni Peris Mingot, Jorge Delmonte (who was substituting for Cynthia Silveira) and Ieda Gomes (who was substituting for Augusto Salomon).

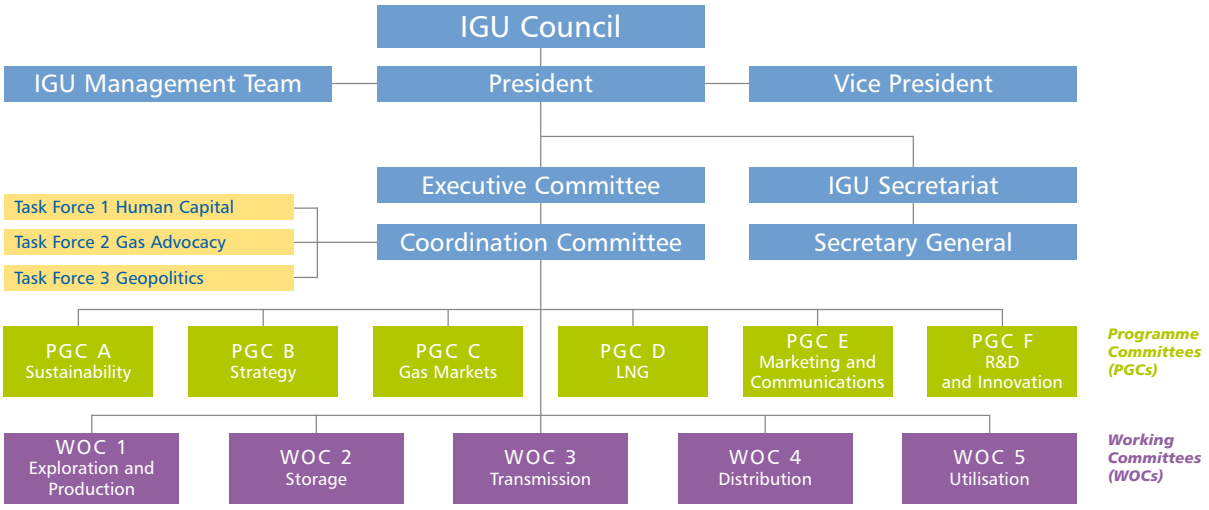
In the next row are Dietmar Spohn (who was substituting for Gerald Linke), Valérie Ruiz-Domingo, Fethi Arabi (who was substituting for Abdelhamid Zerguine), Cheryl Cartwright and Gertjan Lankhorst.

In the next row are Runar Tjersland, Javier Gremes Cordero, Chris Gunner and Mr Pavol Janočko.

In the next row are Jean Schweitzer, Robert Bennett (who was substituting for Khaled Abubakr), Timothy M. Egan and Kyoji Tomita.

Behind them are Paco Freens, Jae-Seob Kim and Marcel Kramer and in the last row are Dave McCurdy, Kang-Soo Choo and Xia Yongjiang.

Lixin Che and Evgueni Riazantsev were unable to attend the photo session.



IGU Management Team

Mr Jérôme Ferrier, President (France)

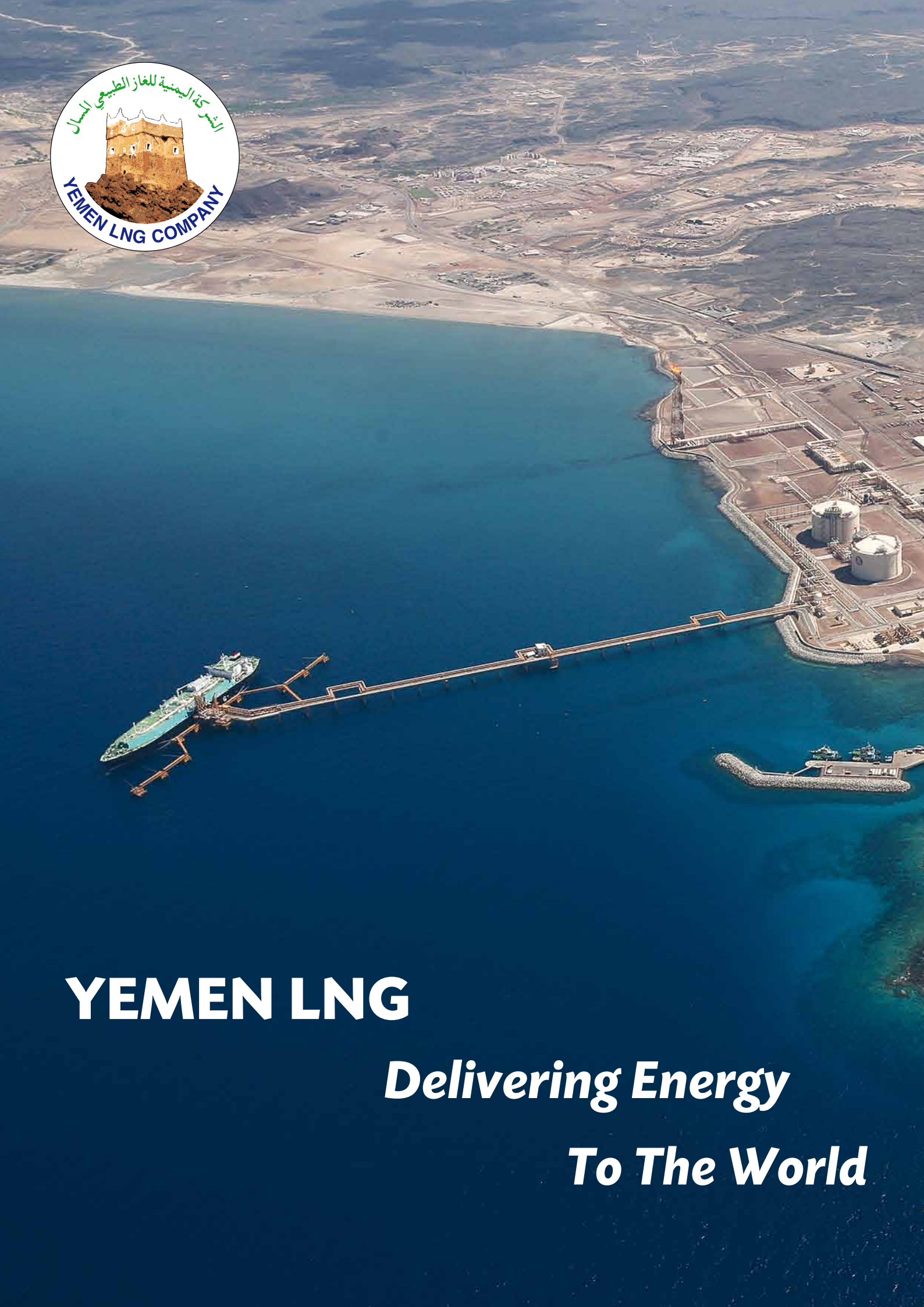
Mr David Carroll, Vice President (USA)

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

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

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

Mr Pål Rasmussen, Secretary General



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Key Milestones

JAN 1995
Yemen LNG established

MAR 1997
Yemeni Parliament ratifies the Gas Development Agreement

AUG 2005
Yemen LNG signs sales & purchase agreements with KOGAS, GDF-Suez and Total Gas & Power Ltd

SEP 2005
Construction of the plant and pipeline begins

MAY 2008
Yemen LNG signs $2.8 billion of project financing

MAY 2008
Yemen LNG completes 320km gas pipeline construction from Marib fields to Balhaf

NOV 2009
Yemen LNG exports its first cargo of liquefied natural gas

JUN 2010
Yemen LNG fully inaugurated, with both trains operating

NOV 2012
Yemen LNG successfully achieves Lenders' Completion from its project financing consortium

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News from the Presidency and Secretariat

Strategic cooperation with international organisations

In recent years, gas advocacy has been high on IGU's strategic agenda and it will play an even more important role in the Union's plans for the future. Gas advocacy has also been highlighted as one of the top priorities in a survey carried out by the incoming US Presidency of what members consider to be the most important issues for IGU. As part of this gas advocacy work, IGU has identified strategic cooperation with other international organisations as an important activity.

In September 2014, IGU signed a two-year memorandum of understanding (MoU) with the World Bank covering collaboration on activities aimed at enhancing technology- and knowledge-transfer. Then, in November 2014, IGU and the United Nations Economic Commission for Europe (UNECE) agreed a four-year MoU.

IGU is now in discussions with several other organisations that are interested in strategic cooperation or collaboration, with the aim of reaching more agreements during 2015. This will give us excellent opportunities to reach out to stakeholders in new areas and regions with our messages on gas.

New secondee

IGU is pleased to announce that Mr Taeksang Kwon, seconded from Korea Gas Corporation (KOGAS), joined the Secretariat in January.

The staff of the IGU Secretariat: (*from left to right in the front row*) Mats Fredriksson, Director; Khadija Al-Siyabi, Senior Advisor & Webmaster; Anette Sørum Nordal, Administration Consultant; Taeksang Kwon, Advisor; (*from left to right in the back row*) Torstein Indrebø, Honorary Secretary General; Pål Rasmussen, Secretary General; and Sjur Bøyum, Communication Manager.

Taeksang studied biology at Seoul National University and went on to study economics and finance with the aim of contributing to social welfare. He is a chartered financial analyst and joined KOGAS in 2002, where his first job was working in the audit and finance department of Pyeongtaek LNG terminal. Subsequently, KOGAS generously supported his studies at the École des Hautes Études Commerciales de Paris to obtain an MBA.

Taeksang speaks Korean and English and is learning French. In his free time he sings in a choir and enjoys playing the piano and cello. IGU is very thankful to KOGAS for their kind support and we wish Taeksang all the best for his secondment.

▲ Taeksang Kwon.

Meeting with the EU Ambassador to Norway

An IGU delegation led by Pål Rasmussen met the EU Ambassador to Norway, Helen Campbell, and her colleagues on January 11. The meeting discussed global and European energy challenges.

International Mediterranean Energy Conference, Istanbul

Torstein Indrebø attended the International Mediterranean Energy Conference in Istanbul, Turkey, on December 8, 2014, and gave a presentation on "Trends and Perspectives of the Global Gas Industry".

The conference was organised by the Association of Mediterranean Chambers of Commerce and Industry and the Chamber of Commerce of Istanbul. It discussed energy as a key factor of development in the Mediterranean region, and the energy interdependence and complementarity which links the countries from both shores of the region, and consequently encourages more in-depth energy cooperation.

Energy Charter, Astana

Torstein Indrebø attended the 25th Meeting of the Energy Charter Conference on November 27, 2014 in Astana, Kazakhstan. The topic of the conference was "Development of Transit Corridors – a Key to Global Energy Security". Torstein chaired a session on the views of producing, transit and consuming countries, and used the opportunity to meet representatives of the Kazakh gas industry.

UNECE, Geneva

Torstein Indrebø and Mats Fredriksson attended the 23rd session of the UNECE Committee on Sustainable Energy in Geneva, November 19-21, 2014, where Mats gave a presentation on "The Role of Gas in Energy Access and Economic Development".

Torstein and Mats took the opportunity of their visit to meet Christian Friis Bach, UNECE Executive Secretary to discuss further cooperation with IGU and establish an MoU between both parties. UNECE recognises IGU, with its global membership, as the voice of the gas industry and the leading advocate of the responsible, equitable and sustainable use of gas worldwide. For its part, UNECE, through its

▶ Torstein Indrebø addressing the 25th Meeting of the Energy Charter Conference on November 27, 2014 in Astana, Kazakhstan.

▲ Christian Friis Bach, UNECE Executive Secretary, and Torstein Indrebø shake hands on the new MoU.

Group of Experts on Gas, is the only UN intergovernmental body that deals with natural gas.

IGU is already active in the Group of Experts on Gas, providing expertise and sharing the results of the study programmes of its technical committees. IGU also provides expertise to the UNECE task forces on gas and renewables, gas and transportation, methane leakage and LNG.

Using UNECE as a platform, IGU could become part of critical intergovernmental mechanisms and have a role in future standard-setting work that may shape the increasingly important role of gas in the future energy supply.

▼ *From left to right in Vienna are:* Torstein Indrebø, Dr Kandeh Yumkella, Jérôme Ferrier and Pål Rasmussen.

US DOE and GGFR, Washington DC

On November 14, 2014, Torstein Indrebø and Pål Rasmussen joined by Kevin Hardardt, Chief Financial and Administrative Officer of IGU Charter Member the American Gas Association, visited the US Department of Energy in Washington DC to discuss potential cooperation on "Power Africa".

"Power Africa" is a five-year initiative launched by President Barack Obama in July 2013. The initiative aims at supporting economic growth and development by increasing access to reliable, affordable and sustainable power in Africa.

While in Washington DC, the IGU delegation also met Bjørn Håmsø, Manager of the World Bank-led Global Gas Flaring Reduction partnership and his colleagues, and representatives of the UN Foundation, to share information and update each other on organisational changes.

SE4ALL and OFID, Vienna

Jérôme Ferrier, Torstein Indrebø and Pål Rasmussen met Dr Kandeh Yumkella, IGU Wise Person and Special Representative for the UN Sustainable Energy for All (SE4ALL) initiative, in Vienna on November 2, 2014 to discuss further cooperation and IGU support for SE4ALL. The aim is to arrange a joint gas event in East Africa to share knowledge about gas and the gas industry.

Following the meeting, Jérôme, Torstein and Pål represented IGU at a joint symposium organised by the OPEC Fund for International Development (OFID) and the World Petroleum Council at OFID's headquarters in Vienna. The symposium was held November 3-4 and discussed how the petroleum industry could contribute to the mitigation of global energy poverty.

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From left to right during IPI's visit to the IGU Secretariat are: Torstein Indrebø; Walter Kemp, IPI's Senior Director for Europe and Central Asia; Terje Rod-Larsen, IPI President; Pål Rasmussen; and Camilla Reksten-Monsen, Special Assistant to the IPI President.

International Peace Institute visit, Oslo

A delegation from the International Peace Institute (IPI), headed by Terje Rod-Larsen, President and CEO, visited the IGU Secretariat on October 30, 2014. The delegation discussed future cooperation opportunities between IPI and IGU with Torstein Indrebø and Pål Rasmussen.

West Africa Gas Conference, Nigeria

The West Africa Gas Conference, presented by IGU Charter Member the Nigerian Gas Association, took place in Abuja, October 28-30, 2014. It addressed the role of gas in unlocking potential and driving economic growth in the region. Jérôme Ferrier participated as a panellist

From left to right at the West Africa Gas Conference are: Mutiu Sunmonu, Managing Director Shell Nigeria; HE Professor Chinedu Webb, Nigerian Minister of Power; Joseph Thiama Dahwa, Group Managing Director NNPC; Saidu Mohamed, President of the Nigerian Gas Association; and Jérôme Ferrier.

Torstein Indrebø being presented with a diploma and gift by SGOA's President, Pavol Janočko, as SGOA's Executive Director, Ján Klepáć looks on

in the session "The Age of Gas: The Growing Importance of Gas in the Global Energy Mix".

Slovak Republic

IGU was invited by Charter Member the Slovak Gas and Oil Association (SGOA) to attend its Autumn Conference 2014 which took place in Vysoké Tatry, October 9-10. The SGOA President and member of the IGU Executive Committee, Pavol Janočko, and Executive Director of SGOA, Ján Klepáć, presided. The conference was attended by around 300 delegates from Slovakia and international guests. Torstein Indrebø represented IGU and gave a presentation entitled "European Gas Industry – The Way Forward". Torstein was awarded a diploma by SGOA for his support in strengthening the relationship between IGU and the Slovak Republic. He was also interviewed by a local gas magazine. SGOA is very supportive of IGU activities and currently chairs Working Committee 2 – Storage.

St Petersburg International Gas Forum

Jérôme Ferrier participated in the Fourth St Petersburg International Gas Forum, October 7-10, 2014. This is considered to be the largest annual industry event in Russia, where international partners for large-scale projects – such as engineering companies, investors, developers and equipment suppliers – can meet. Jérôme gave a presentation entitled "Natural Gas in the Future World Economy".

LNG Asia-Pacific Summit, Singapore

IGU was represented by Jérôme Ferrier at the 6th World LNG Series: Asia-Pacific Summit, which was organised by CWC in Singapore,

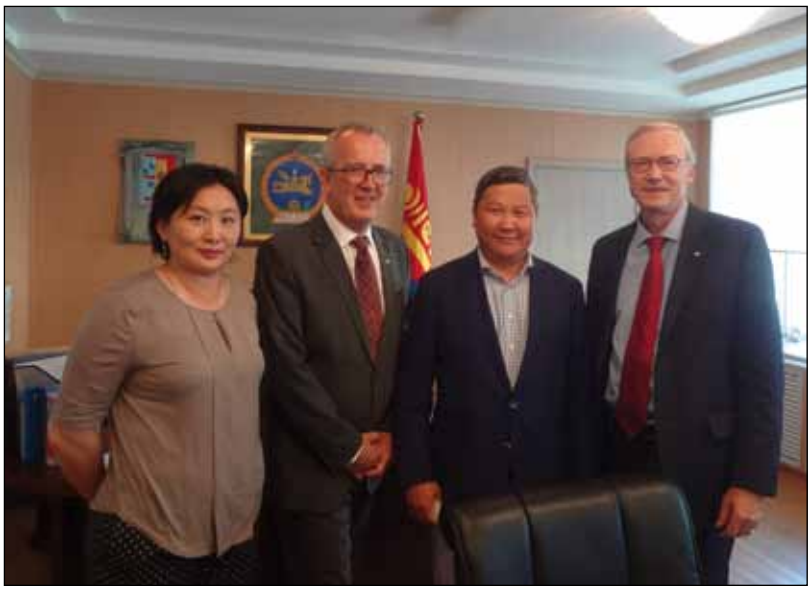
Jérôme Ferrier giving a keynote address at the 6th World LNG Series: Asia-Pacific Summit in Singapore.

From left to right at GAS 2014 are: Svetomir Milinković, President of the Managing Board of GAS; Sladjana Tripunović, Technical Secretary of GAS; Torstein Indrebø; Ljubinka Milenković, translator; and Vojislav Vuletić, President of the Assembly of GAS

September 24-26, 2014. He presented a keynote speech entitled "The Changing LNG Demand and Supply Outlook".

Divčibare, Serbia

Torstein Indrebø attended the 18th Conference on Gas and the Gas Industry organised by Charter Member the Gas Association of Serbia (GAS). The event was held in Divčibare, September 23-26, 2014. The President of the Managing Board of GAS, Svetomir Miinković, and the Secretary General of GAS, Živojin Knežević, were present at the conference and Torstein gave a keynote address on global gas perspectives. GAS and IGU discussed future IGU support for regional Balkan conferences and also cooperation in related activities.



Pål Rasmussen and Torstein Indrebø with Altanchimeg Dambadarjaa (*far left*) and Dorgpurev Dulamsuren (*third left*) in Ulan Bator.

Ulan Bator, Mongolia

IGU represented by Torstein Indrebø, then Secretary General, and Pål Rasmussen, then Deputy Secretary General, met HE Dorgpurev Dulamsuren, Vice Minister in Mongolia's Ministry of Energy and Ms Altanchimeg Dambadarjaa, Specialist, Department of Policy, in Ulan Bator on September 2, 2014. The IGU team presented an update on the Union's membership and activities, and discussed further involvement of Mongolia in IGU. The Mongolian delegates expressed strong interest in enhancing their country's presence in IGU,

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and confirmed the application of the Mongolian Energy Economics Institute to become an Associate Member.

4th China International LNG Conference, Beijing

IGU's President, Jérôme Ferrier participated in the 4th China International LNG Conference, which took place in Beijing, China, September 1-3, 2014. The event's theme was "Rethinking Opportunities and Challenges", and he gave a presentation entitled "Will LNG Exports Drive Global Price Integration?"

ONS, Stavanger

The 40th Offshore Northern Seas (ONS) Conference & Exhibition took place in Stavanger, Norway, August 25-28, 2014. ONS brings the leading players in the international oil and gas industry together with ministers and officials from oil and gas producing countries. The aim is to have the decision makers present when major international issues are discussed. A further goal of the conference is to facilitate knowledge sharing and collaboration across the global energy industry. Members of the IGU Secretariat attended the exhibition and held meetings during the event.

Meeting of Nordic, Baltic and Polish Charter Members, Warsaw

The annual meeting of Nordic, Baltic and Polish Charter Members took place in Warsaw, Poland, on August 21, 2014. It was hosted by the Polish Gas Association (PZITS) through its largest institutional member, the Polish Oil and Gas Company (PGNiG). The meeting discussed the latest developments and plans in each of the countries present, specifically focusing on shale gas and gas as a transportation fuel (CNG and LNG). Representing the IGU Secretariat were Mats Fredriksson, Senior Advisor, and Khadija Al-Siyabi, Advisor. They gave a presentation on IGU's latest activities and forthcoming events.

Søren Juul Hansen of Energinet.dk was one of the speakers at the annual meeting of Nordic, Baltic and Polish Charter Members in Warsaw.

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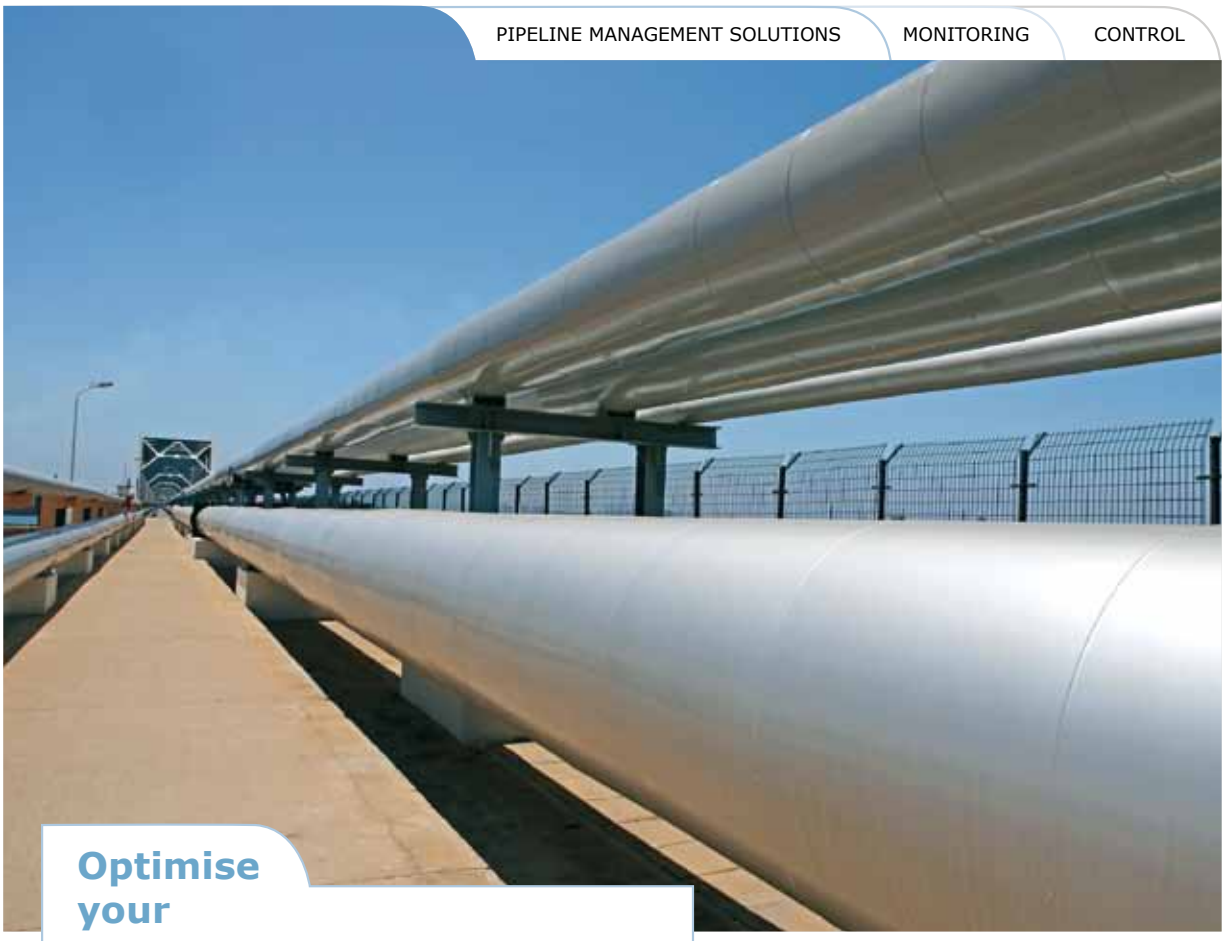

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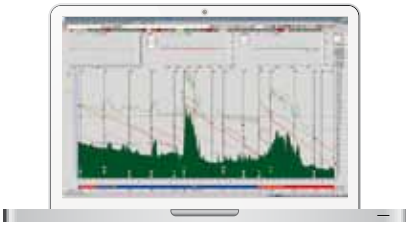

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▲ Ksenia Gladkova.

The business session was followed by a visit to the Polish Gas Museum and dinner. The 2015 meeting will most likely be hosted by the Norwegian Gas Association.

Ksenia says "Всего наилучшего!

My IGU adventure came to its end in October 2014 and I wish to say a sincere thanks to all of you who made it unforgettable. Having the opportunity to spend three years with the IGU Secretariat in Oslo was a privilege and a unique experience. Rare are positions offering such an insight into the global gas industry.

From the human point of view, this was also something unique. While I have worked as part of multicultural teams before, the Oslo Secretariat is definitely a special place thanks to the quality of the people. Clear and positive communication, together with constructive exchange made my everyday work pleasant. I left the Secretariat with a feeling of professional and personal satisfaction. The successful projects carried out are an important reason for this.

Like every secondee, I perfomed a variety of tasks allowing me to experience diverse aspects of the worldwide gas industry. My marketing and membership activities allowed me to get in touch with all the IGU members feeling every bit a part of a truly global structure. IGU activities took me from Houston to Beijing to Sydney via Abidjan or Ashgabat along the way.

The Ministerial Gas Forum in Paris in November 2012 was definitely another highlight. Thanks to thorough preparation, handled from Paris, Oslo and Riyadh, IGU succeeded in holding a top-level forum positioning gas as a cornerstone of the global energy discussion.

It was a great opportunity to participate in the G20 discussions on sustainable energy in Russia in 2013. That was the first time IGU had succeeded in entering this high-level arena of geopolitical discussions and I am extremely happy that IGU is now a regular participant. The importance of raising the voice of gas with top-level policymakers worldwide cannot be overestimated.

Witnessing the UNFCCC COP 19 round of negotiations round in Warsaw in 2013 was also an unforgettable experience. Although the progress of global climate change negotiations has been slower than expected, the COP meetings represent another important arena for gas to show that it has a role to play in a low-carbon sustainable energy future. Organising IGU events within the framework of the UNFCCC negotiations is one of the Union's important initiatives.

Sending a secondee to the IGU Secretariat is of tremendous benefit for the sponsoring company and I would like to encourage gas companies to take advantage of the secondment programme.

I would like to sincerely thank Torstein Indrebø and all the people I have been working with in Oslo – Sjur Bøyum, Mats Fredriksson, Pål Rasmussen, Khadija Al-Siyabi, Anette Sørum Nordal, Carolin Oebel and Hans Riddervold for the friendship and support they offered throughout these three years.

I would like to thank Total, and in particular Jérôme Ferrier, for offering me this position. I consider myself lucky and wish Jérôme and the French team (Daniel Paccoud, Yves Tournié and Georges Liens) a very successful end to the French Presidency and a most impressive 26th World Gas Conference in Paris.

I wish the incoming US team led by David Carroll every success in developing IGU's Global Voice of Gas initiative. The potential to enhance IGU's profile and visibility is considerable.

I look forward to seeing you again soon. All the best! Всего наилучшего!

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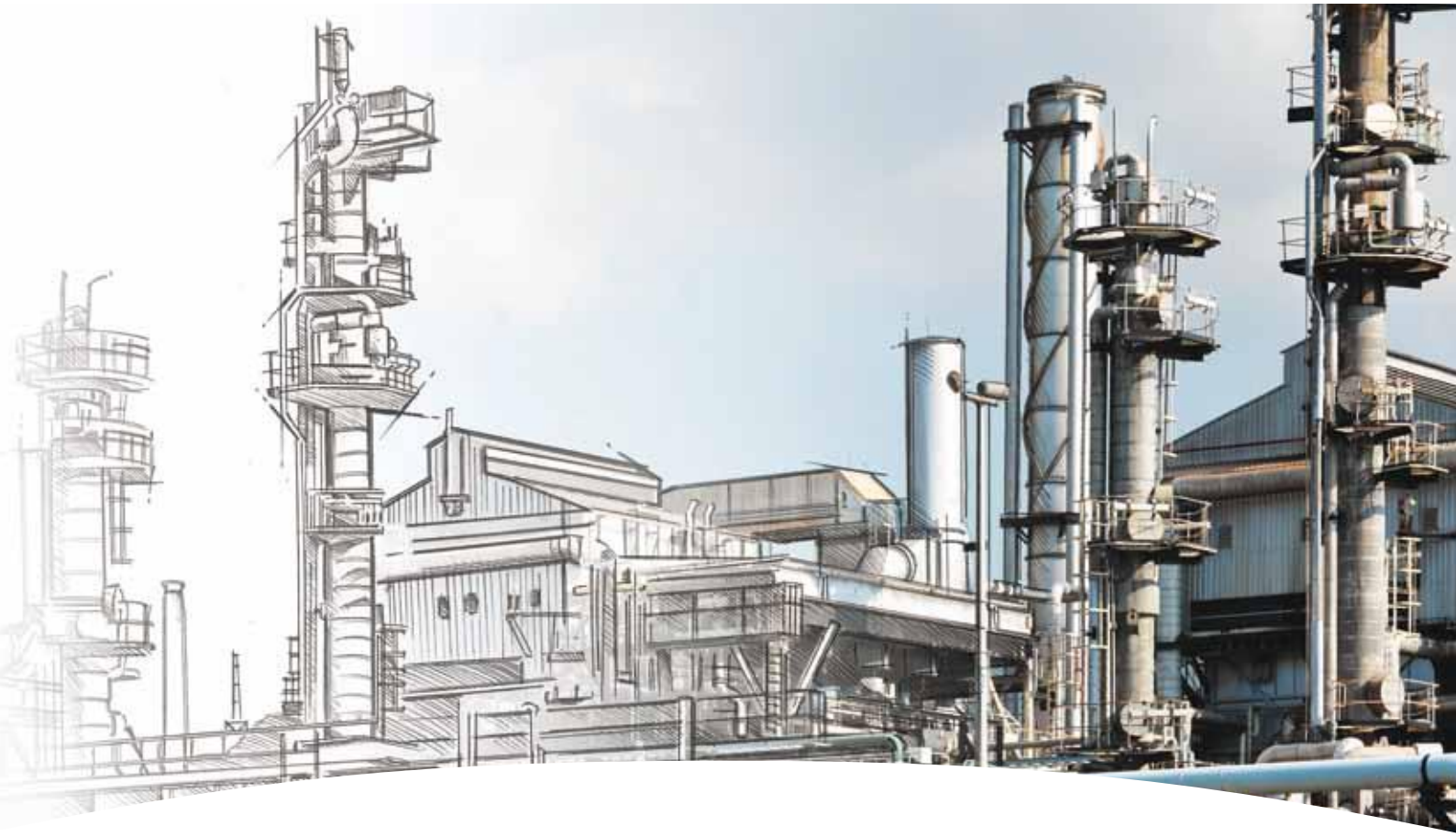

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▲ Khadija Al-Siyabi.

A warm goodbye from Khadija

In some workplaces, people are more than just colleagues, they are people whom you've enjoyed seeing every day, and whom you will miss when you leave. The IGU Secretariat is one of those special workplaces which is a community of friends whom I will truly miss. During the past two years, I have enjoyed working for IGU and learnt so much from all of you. This wouldn't have been possible without your support, guidance and encouragement throughout.

This transfer in my career has developed me both personally and professionally. I will start by sharing my personal experience. I remember when people asked me, "so how is Norway compared to Oman?" I would reply "different" and add "literally".

Back in Oman, life is very simple, despite the extreme hot summers, believe it or not. All you need is a good air conditioning system. In Norway, it is quite the opposite, way more complex. You have to have something special for everything, a "smart solution". Actually, the first thing I was told upon arrival was, there is no such thing as bad weather, it's just bad clothing! To be honest, I first thought this was some sort of a standard motivational statement said to all new secondees arriving in Norway, but I soon realised that it was true.

Soon after my arrival, which was during winter, I went winter shopping. The Norwegian advice I had received was that in Norway, it is important that you buy a good jacket rather than focusing on a nice one. I tried to look for a combination of the two, but it was the most difficult combination I had ever gone searching for, and finally gave up. To make it simple, I asked for an "everything proof" jacket meaning wind, rain, snow…etc. The result was a huge "polar bear" jacket, the way I like to call it, not so fancy looking but certainly fit for purpose.

Turning to my professional experience, working in IGU has been a great professional development programme for me. I have had the pleasure to work with two great leaders, firstly with Torstein Indrebø when I joined IGU and later with Pål Rasmussen. I would like to extend my sincere thanks and appreciation to both of them. In addition, I have been blessed with very friendly and professional colleagues in the Secretariat, who created a pleasant atmosphere at work and from whom I learnt a lot.

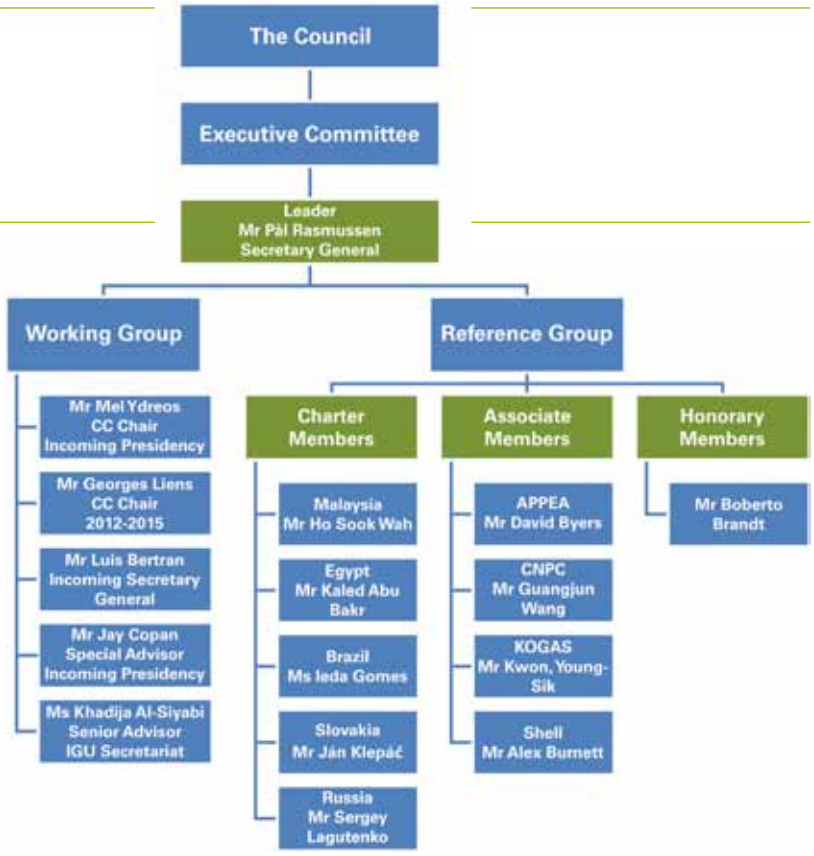
In IGU, starting off with membership and marketing tasks was a great way for me to get to know the Union and learn more about its history, as well as its role in the gas industry. I am glad to have seen the increase in membership especially from the Middle East, where I played a role in developing good relationships for IGU.

Furthermore, communication has been a major role in my assignment, and I have contributed to two strategic projects. For the Global Voice of Gas project I played a key role in the initial phase of launching the new gas portal and managing it thereafter. I was also a member of the Building for the Future working group.

I believe working in IGU offers a unique experience and, with the support of IGU's strong strategic objectives, it provides a thorough understanding of the importance of gas in our lives and its contribution to a sustainable energy future. My vision of gas today is different from what it was a few years ago. Gas is more than just a traded commodity; it is a great energy solution for a better future.

Once again, I would like to dedicate my special thanks to IGU for offering this fantastic career development opportunity to its members, and to my manager Adnan Rajab and Oman LNG for fully supporting me in it. Last, but not least I also dedicate a special thank you to all of you for making it a rewarding experience.

Building for the Future



In light of changes in the global gas markets and the growth of the Union in recent years, IGU has introduced the "Building for the Future" project. The initial proposal was presented to the Council and approved during its meeting in Berlin on October 16, 2014.

The project's objectives are to:

- Ensure a platform for growth and continuity in IGU so that the Union is properly positioned for the future;
- Support the IGU strategic projects that aim to support advocacy for gas globally by finding a reliable funding solution.

The project scope will include:

- Revisiting the vision, mission and objectives of IGU;
- Defining the strategic focus of IGU;
- Reviewing and revising the membership fee structure;
- Reviewing and revising the Articles of Association.

A dedicated team headed by Secretary General, Pål Rasmussen, was appointed in Berlin to work on this strategic project. It comprises a Working Group and a Reference Group representing members from all parts of the gas value chain, Charter and Associate, small and large.

At press time, progress on the project was due to be discussed during the Executive Committee meeting in Abu Dhabi on March 25. The project report will be presented for approval in the Council meeting in Paris on June 1.

▼ The Building for the Future working group met in Paris on February 11. *From left to right are:* Georges Liens, CC Chair; Mel Ydreos CC Vice Chair; Pål Rasmussen, Secretary General; Khadija Al-Siyabi, Senior Advisor; Luis Bertrán Rafecas, Deputy Secretary General; Jay Copan, Special Advisor to the incoming President; and Mats Fredriksson, Director.

Q&A with Torstein Indrebø and Pål Rasmussen

IGU's new Secretary General Pål Rasmussen took over from Torstein Indrebø on December 1, 2014. To mark the changeover, the IGU Magazine asked Torstein about the major developments during his tenure and Pål about the challenges going forward.

Torstein, during your time as Secretary General IGU's cooperation with other international organisations and range of activities increased considerably. Could you highlight the major developments?

We have all observed that gas markets have become more globalised with the increase in cross-border gas trade via pipelines and LNG. With this in mind, it is only logical that issues related to global gas markets and energy policy/regulations will move higher up the agenda for all players, including inter-governmental institutions such as the International Energy Forum (IEF), United Nations, World Bank and G20 Group.

▼ Torstein Indrebø formally handed over to Pål Rasmussen on December 1, 2014.

Many international processes are now related to energy, among them climate change, social and economic development, global energy security, as well as health and energy. IGU and many of our members are involved in these processes.

This development has increased the need for more dialogue and interaction between governments/intergovernmental organisations and industry. IGU, the largest and only global organisation with members representing the whole gas value chain can provide insight and industrial perspectives on markets, investments, technology and sustainability. This input is important when positions on energy policy are discussed.

In 2008, we initiated the biannual Ministerial Gas Forum with IEF, which is now well established as an arena for high-level global dialogue on gas issues. The Forum has been organised four times: in Austria, Qatar, France and the last one in Mexico in 2014.

In 2010, Dr Kandeh Yumkella, CEO of the UN initiative Sustainable Energy for All (SE4ALL) launched by UN Secretary General Ban Ki-Moon, became one of the Wise Persons of IGU. As a result of this engagement we embarked on a more structured cooperation with the UN and World Bank which led to the signing of a Memorandum of Understanding (MoU) with the World Bank in 2014.

Under the Russian Presidency of the G20 Group in 2013, IGU was invited to attend meetings in their Energy Sustainability Working Group and related workshops. Our contributions there were obviously valued as we have been invited to subsequent meetings under the Australian G20 Presidency.

IGU benefits a lot from these relationships and dialogue events as we can better under-

stand the political priorities and can feed that back to the IGU working programme and long term planning.

Another major initiative has been the increased focus on gas advocacy and communication, an area of utmost importance for a global organisation like IGU. We launched the publication A Global Vision for Gas in 2012, and followed up with the strategic project "Global Voice of Gas" in 2013 – still ongoing – to reach new audiences with comments, messages and facts.

▲ The IEF-IGU Ministerial Gas Forum was launched in 2008 and four were held during Torstein's term.

How did you structure the Secretariat to deal with IGU's enhanced global role?

Both the Presidency and Secretariat had to divert more management resources towards the new global partners as the interaction often takes place at the highest level. I was fortunate to have an experienced staff in place which also included highly competent and experienced secondees from our membership, which gave us additional capacity and the ability to expand our activity level.

We reviewed our publication strategy and media approach to reach a wider and less technically-oriented public. The IGU website and content have been revised several times – a constant process in the new media world.

It is important to recognise that IGU has to earn a place at the table of the influential intergovernmental organisations when energy is on their agenda, meaning that we have to provide quality interventions, presentations, publications and reports. The study work and reports prepared by our professional committees and task forces are critical to maintain this position.

You have worked with IGU Presidents from Argentina, Malaysia and France. How have you found the working relationship with each Presidency?

The main operational and strategic issues are always discussed between the Secretariat and the Presidency. It is therefore very important to establish a good and well-functioning relationship with the Presidency. Modern communication technology has provided us with means to overcome the vast distance between us. The teams on both sides meet for monthly video or phone conferences to discuss topics on the agenda, and agree on how to approach new developments or media issues. In between these meetings we communicate by email and telephone. We also often go together to major events to represent IGU and have joint meetings with partners.

I started my term in November 2007 which was in the middle of the Argentine Presidency about two years before the 24th WGC in

▼ Torstein has worked with three IGU Presidents. At WGC 2009 in Buenos Aires, Datuk Rahim Hashim (*left*) took over from Ernesto López Anadón.

Jérôme Ferrier took over from Datuk Rahim Hashim at WGC 2012 in Kuala Lumpur.

Buenos Aires and had a very steep learning curve. President Ernesto López Anadón and Coordination Committee (CC) Chair Roberto Brandt had initiated many activities, and several reforms were introduced during their term. This included a stronger regional presence with the appointment of Regional Coordinators and the decision to focus more on sustainability and climate related activities. We also saw the need for enhancing the IGU orientation on marketing activities, resulting in a new committee for marketing.

When Malaysia took over with President Datuk Rahim Hashim and CC Chair Ho Sook Wah, we set a strategic goal to make IGU more visible and relevant as a global organisation. This meant a modernisation of the IGU profile and a new logo was designed with the support of the incoming French Presidency. We made major advancements in global gas advocacy by increasing our engagement with climate groups and policy-making institutions at regional and global level, including UN bodies. Furthermore, our communication and publication activities were significantly upgraded.

France with President Jérôme Ferrier and CC Chair Georges Liens assumed the IGU Presidency in June 2012. We continued the strategic focus on communication by launching the Global Voice of Gas project, a very demanding one in terms of expertise and finances. In 2013/2014 we have consolidated the cooperation with UN organisations such as UNESCO and UNFCCC, the World Bank and the G20 Group. We have also been successful in bringing in many new members.

My experience is that a systematic and continued focus will eventually produce results, but also that many processes/projects often need a time horizon covering several Presidencies and even crossing over to future Secretariats. I am fortunate to have enjoyed an extremely productive and pleasant working relationship with the IGU Presidents and their team. It seems that gas people around the world work well together independent of nationality, religion and political background.

What are your plans for the future?
Well, I will not leave IGU completely as I have agreed with Pål to perform the secretariat function for the LNG 18 Steering Committee which is responsible for the planning of future

LNG events. As you know, LNG 18 will take place in Perth in April 2016, and we (IGU, GTI and IIR) have already started the planning for LNG 19 in Shanghai in 2019. The last meeting of this committee will be in autumn 2016 when a new one will be constituted. I will also be around for advice and support to Pål if needed for other projects. I hope to stay in contact with IGU friends around the world by attending events and conferences from time to time. Retirement also means more free time for family and friends, and hobbies like fishing and hunting. My freezer will not run empty of fish or meat in the coming years!

Pål, what do you see as the major challenges for IGU going forward?

Managing IGU is like riding a bicycle; you must be in constant movement to avoid falling over. All our strategic processes are under constant development and change; this is the way it has been and this is the way it will always be.

IGU has a vital role as the spokesperson for the gas industry worldwide, but various organisations are challenging the Union in different areas. We need to be focused and united to hold on to our strong position as the Global Voice of Gas.

We are becoming increasingly global as an industry, which creates more demand for information from, and about, different parts of the world. We must meet these requirements in the industry and in political arenas, reaching out to decision makers and opinion formers. In my view, IGU needs to focus more efforts on the external arena in close cooperation with the gas industry.

Gas is part of an integral, long-term, sustainable energy solution; and we need to unite our messaging in all relevant arenas in the coming year, for example towards COP 21. I would like to see greater uniformity in our messaging globally. The Coordination Committee, the core of our Union, should have a vital role in this process with intermediate deliveries to the Management Team to support our overall messaging.

These challenges will also have administrative effects for IGU. We have to ask whether we have the correct organisation for the future and if we have the required funding. In my opinion the answer is no. Very soon after my arrival, I saw the need for an open discussion with a wide involvement of members to develop a good solution for a prosperous future for the Union.

In the short term we will be challenged by the handover from the French to the US Presidency, and later a transfer of the Secretariat from Norway to Spain. We will also have to

Pål worked alongside Torstein as Deputy Secretary General during a 13-month handover period. He represented IGU at a number of events including OGU 2014 in Tashkent.

identify the required qualified resources for the Secretariat.

How will you address them?

Last autumn we initiated the "Building for the Future" project which over time will cover most of these challenges. This project is presented in more detail in a separate article in the magazine, but initially we will revisit the vision and mission of IGU and then develop strategic initiatives and resource them. I am pleased to see how colleagues in the Union have engaged with this project.

We are well underway with the Global Voice of Gas project, which will make the Union much more visible in the external arena. The operational part of this project started as I joined the Secretariat, and it has been interesting to follow developments and discover the opportunities it opens for IGU. We are still working on the future funding, but through Building for the Future we will ensure funding from 2016, if approved by our governing bodies.

As part of the project we have initiated a new communication strategy for 2015 which will unify the messaging of IGU. This is an important step forward and will underpin IGU's role as the Global Voice of Gas.

We have also increased our efforts to develop cooperation with external organisations, and my ambition is to sign between four and six new MoUs in Paris during WGC 2015. Through these agreements, representatives from IGU will be sitting at the table with decision makers in organisations such as UNECE, IPI and SE4ALL. We are also working to establish closer relationships with organisations like UNEP, UNFCCC and IRENA. In my opinion this is important as there is a high demand for information on gas in these organisations. But this is not solely about gas; it is about the role of gas in energy and health, energy and development, energy and emissions, energy and security, to give some examples.

There have been other changes in the staff of the Secretariat. Can you introduce your team to us?

IGU needs a strong Secretariat, and we are fortunate to have companies which are willing to take on the long-term commitment of covering the cost of hosting us and providing us with senior personnel. I would like to thank Statoil for their huge contribution to IGU since we moved to Norway in late 2007.

As of today, Statoil is providing Mats, Torstein, Sjur and Anette to the Secretariat. Torstein will retire soon, but knowing him well I guess we will see him in the corridors even after his retirement, and I will make sure he feels welcome. Mats, Sjur and Anette are now the seniors of the team, and I hope I will see them all around until the end of the Norwegian term.

Khadija is unfortunately leaving us, and that will be a great loss both socially and professionally. She has contributed in a very positive way to the team but her secondment has come to an end and she has commitments in Oman.

Teaksang Kwon is the new member of the team from KOGAS (Korea). I welcome him to Norway and am sure that working with our first secondee from Asia will be a positive experience. In my view it is important to have global representation in the Secretariat

We are discussing additional secondee agreements, and I am optimistic that we will get a new agreement in place soon. Towards the end of 2015 we will see the arrival of one secondee from Spain, and during the summer of 2016 Luis Bertran will join my team in Oslo.

So even though we had to say goodbye to Carolin and Ksenia last autumn, and the fact that we are now saying goodbye to Khadija, we will have a solid team, with a strong and competent resource base in place and available for the Union.

IGU's membership is growing. Could you outline the benefits being part of the IGU family brings to members?

It is great to see the many new members joining us for many reasons. The gas majors and key gas countries see the value of our gas advocacy activities regionally and globally. IGU is commercially neutral, covers the whole gas value chain and represents an additional channel for promoting the interests of the gas industry. Commercial companies can more easily be suspected to advocate for their own commercial interests.

The main reason for most new members to join is the extensive study programme of IGU carried out by the committees and task forces. All IGU members have the opportunity to influence the study work and of course to attend the meetings and access all the work. In the committees the participants share experience and competence. IGU offers a huge network where people can meet and discuss issues without formal appointment. Personal relationships are still of great value in this long-term business.

Members are also represented in the IGU Council where main decisions are made, they can run for leadership positions in the IGU organisation, and they can apply to host IGU events and conferences.

It's going to be a busy year with WGC 2015 and the change in Presidency. Is everything in hand for the handover from France to the USA?

First of all I urge all readers to come to Paris in June for the largest and most important gas event in the world, and I challenge all of you to bring two of your colleagues as well. This is the one event all senior people of the gas industry have to participate in. The French team have organised a fantastic event, and I think we all should feel proud to be part of this.

Regarding the handover, the change of Presidency is one of the transitions we know how to do, as it takes place every three years. There is an established procedure and it all comes down to what this Union is really good at – sharing information globally. And with the openness of the French team and the enthusiastic approach of the US team I am convinced that there will be a seamless overlap.

Can you brief us on IGU's plans for the COP 21 Climate Change Conference at the end of the year?

As I mentioned earlier we have a new communication strategy for 2015. COP 21 is identified as a key event in this strategy and we are planning a range of initiatives. We will target the event on the portal with a separate campaign, we will prepare separate reports and we will participate in COP 21 with a side event. As this process develops we will inform and engage members and committees.

But time is short, and during the coming months the draft agreement for COP 21 will be discussed in all member countries. IGU members must engage in their respective national processes. Find your approach to the process and advocate for natural gas. This is a window that we have now and it is important that all IGU members participate in their local debates.

On behalf of the global gas industry IGU will use COP 21 and the process leading up to it to ensure that natural gas is included in the long-term sustainable energy solution for the world.

▼ The call for climate action at COP 20 in Lima put the world on track for COP 21 in Paris.

Bringing gas from source to end user

Pipeline construction and beyond

In 2014 A.Hak played a major role in completing Gasunie's ambition to turn the Netherlands into Europe's 'gas roundabout' by constructing a 60 kilometre gas pipeline. With over 50 years of experience in pipeline construction, A.Hak was the right partner to successfully finish this challenging project. Away from its Dutch headquarters, the company helps bring gas from source to end user in countries such as Germany, France and Austria. Meanwhile, A.Hak actively participates in several companies and initiatives in the field of renewable energy technology.

The French Arc de Dierry project in which A.Hak International is taking part: pipeline construction for GRTgaz.

The gas transport pipeline between the compressor stations in the Dutch towns of Beverwijk and Wijngaarden measures 90 kilometres in length. As the main contractor, A.Hak Leidingbouw (Dutch for Pipeline Construction) constructed a total of 60 kilometres, in close cooperation with several subcontractors, most of them specialized A.Hak subsidiaries. For instance, A.Hak Drillcon, that carried out the necessary drilling, A.Hak Pipeline Services, that was signed for testing and dehydrating the pipeline and Conline-Rhenania, that coated and stored every single pipeline segment before any of the others got to work.

A project of extremes

The construction of this particular pipeline can truly be called a project of extremes. A.Hak worked in densely populated areas, as well as at terrains so remote that even trucks could hardly reach it. Water management and soil conditions required all of the ingenuity the project team could muster. On top of that, the trajectory contained a large number of obstacles that were to be crossed. Railways, highways, innumerable amounts of ditches, shipping lanes and as a cherry on the pie: Amsterdam's Schiphol Airport.

Joint-ventures

In Germany, A.Hak Drillcon is the main contractor for the construction of a pipeline for Gasunie Deutschland in which the river Elbe is crossed with a large tunnel. Another German project involved the building of a new compressor station near Embsen by A. Hak Leidingbouw and Max Streicher, while in Austria Leyrer&Graf was the partner of choice for the construction of yet another transport pipeline. For GRTgaz, A.Hak International is responsible for the construction of the Arc de Dierry pipeline from Paris to Lyon, working in a joint venture with Spiecapag.

Horizontal directional drilling under challenging conditions during the Beverwijk-Wijngaarden project for Gasunie in the Netherlands. Carried out by A.Hak Drillcon.

Renewable Energy

As the above-mentioned projects show, the construction of pipelines for natural gas is still very much at the core of A.Hak activities. But the Dutch family owned company is also active in the field of sustainable energy solutions. A.Hak actively participates in innovations with its Renewable Energy division. For instance as a shareholder in REDstack that generates electricity with fresh and salt water, at a plant that was recently opened by King Willem-Alexander of the Netherlands.

Power-to-Gas

A.Hak also participates in Torrgas, a company that developed a new technology for 'torrefaction': the conversion of biomass into 'biocoal', an essential step in the production of synthetic gas out of biomass. Torrefaction will play an important role in 'Power-to-Gas': a solution for the challenge of storing superfluous wind and solar power in gasified form.

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- integrated industrial services
- participating in development and application of renewable energy solutions

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2014 Council Meeting Sets New Record

By Mark Blacklock

An exciting election for the 2018-2021 Presidency, the accession of 17 new members and a preview of the incoming US Presidency's plans for the 2015-2018 Triennium were among the highlights of IGU's 2014 Council meeting, which set a new record for attendance. Delegates also confirmed the change in Secretary General and a new host of the Secretariat.

The meeting was held in the Grand Hyatt Hotel in Berlin, Germany on October 16, following a geopolitics workshop and sessions of the Coordination Committee and Executive Committee on October 14-15. The whole event was hosted by the German Technical and Scientific Association for Gas and Water (DVGW), and was attended by 285 delegates and 55 accompanying persons.

IGU's President, Jérôme Ferrier welcomed delegates and asked them to approve the minutes of the 2013 Council meeting in Beijing, China, before giving the floor to Torstein Indrebø.

This was Torstein's last Council meeting as Secretary General before handing over to Pål Rasmussen and he had other staff changes to announce. Senior Advisor, Ksenia Gladkova and Director, Carolin Oebel were leaving at the end of their secondments from Total and E.ON respectively. Torstein thanked them for their contributions to the Secretariat's work and their companies for participating in the secondment programme. He also introduced Anette Sørum Nordal, who had taken over from Silje Storsul as Administration Consultant in late 2013 and was attending her first Council meeting.

Pål announced that Mats Fredriksson would take over as Director and Khadija Al-Siyabi would be promoted to Senior Advisor and Webmaster. He invited members to nominate new secondees to the Secretariat.

The Council then approved new members of the current Executive Committee to represent Brazil (Augusto Salomon), Germany (Gerald Linke), Japan (Kyoji Tomita) and Qatar (Paco Freens). The Executive Committee for the 2015-2018 Triennium will be elected by the Council during its next meeting immediately prior to WGC 2015 in Paris.

▼ Jérôme Ferrier welcomes delegates to the 2014 Council meeting.

Conferences

With a tight agenda there was only time for a brief statement on the IGU Research Conference which had been held in Copenhagen, Denmark the month before the Council meeting. (For a full report see pages 166-169.)

"IGRC2014 was a huge success with more than 760 participants from 46 countries," said Peter Hinstrup, Conference Director. Jérôme thanked Peter and the Danish team for their hard work. The next IGRC will take place in Rio de Janeiro, Brazil in May 2017.

Torstein advised delegates that the process to select a venue for LNG 20 in 2022 would start in early 2015, with the decision being made during LNG 18 in Perth, Australia in April 2016. He also announced that the venue for LNG 19 in 2019 would switch from Beijing to Shanghai in China.

Jérôme then reviewed final preparations for the 4th IEF-IGU Ministerial Gas Forum. This was hosted by the Mexican Government in Acapulco, Mexico a month after the Council meeting on November 12 with the theme "The Role of Gas in Energy Security and Sustainable Economic Development".

"The cooperation between IEF and IGU has proved very successful," said Jérôme. "The Forum is a unique opportunity for a dialogue between ministers and top executives."

As regards the UN Climate Change Conferences, Jérôme said IGU would not organise a side event at COP 20 in Lima, Peru but rather have a focused campaign towards COP 21 and a strong presence in Paris at the end of 2015, where global leaders are expected to make firm commitments on reducing CO_2 emissions.

New members

The 2014 Council meeting also broke records in terms of the number of applicants for membership – an unprecedented 17 – who were invited to give a short presentation to delegates.

Eight countries were applying or re-applying for Charter Membership: Armenia, Bahrain, Belarus, Bolivia, Chile, Hungary, Kuwait and Yemen. Belarus, Bolivia and Hungary had been Charter Members in the past while Chile had been an observer.

Khadija Al-Siyabi introduces the applicants for membership.

Nine companies and organisations were applying for Associate Membership: Anadarko Petroleum, Bureau Veritas, China LNG Association, Eni, the Indonesian Gas Society, KOGAS, the Mongolian Energy Economics Institute, Pertamina and Santos.

Delegates approved all 17 applications so IGU now has a total of 142 members (91 Charter and 51 Associate). There is also a new organisation affiliated to IGU – the World LPG Association – which brings the total to 12.

"Our IGU family has grown tremendously in the last few years," declared Jérôme.

Introducing the US Presidency

Next up was David Carroll, Vice President, who presented the incoming US team's preliminary plans for the 2015-2018 Triennium.

Announcing that the theme of the US Triennium would be "Fuelling the Future", David explained that the plans had been drawn up following extensive consultation and a survey of members. "We want to build on the strong capabilities of IGU and incorporate some of the unique strengths and capabilities the American team can bring," he said.

David Carroll presents the incoming US Presidency's plans for the 2015-2018 Triennium.

The survey highlighted access, markets and pricing as the most important issues facing the industry, and the importance of IGU's advocacy role. "We want to enhance the value that you receive as members," continued David. He explained that the detailed Triennial Work Programme (TWP) would be developed in conjunction with the current committee vice chairs who will become the chairs for 2015-2018. (They were confirmed later in the meeting along with the new vice chairs – *see table*.) The TWP will then be presented to the Executive Committee and Council for approval and be launched at the end of WGC 2015.

Leadership of the Technical Committees 2015-2018

Committee	*Country Chair*	*Country Vice Chair*
WOC 1 Exploration & Production	Malaysia	Russia
WOC 2 Storage	Russia	USA
WOC 3 Transmission	Czech Republic	France
WOC 4 Distribution	Spain	Brazil
WOC 5 Utilisation	Iran	Spain
PGC A Sustainability	Argentina	Malaysia
PGC B Strategy	The Netherlands	Germany
PGC C Gas Markets	Algeria	China
PGC D LNG	Japan	Algeria
PGC E Marketing & Communications	Australia	The Netherlands
PGC F R&D & Innovation	Germany	Japan

David introduced the rest of the US team. Apart from himself as President and Mel Ydreos as CC Chair, the key members will be Terry Thorn as CC Secretary, Dave McCurdy, President & CEO of the American Gas Association as Chair of the National Organising Committee (NOC) for WGC 2018 and Jay Copan as Executive Director of WGC 2018. Jay will also be a Special Advisor to the President while Lori Traweek will serve as Chief Operating Officer for the US Presidency.

"Our entire team looks forward to working with you," declared David.

New Secretary General and host of the Secretariat

The Council went on to confirm Pål Rasmussen as Secretary General for the period December 1, 2014 to October 31, 2016. One priority of Pål's tenure will be to re-evaluate the vision, mission and objectives of IGU and how the Union is funded, and delegates approved the setting up of a project team with representatives from across the global gas chain. The project is called "Building for the Future" and the team will report back to the Council later in 2015.

With Norway's term as the host of the Secretariat ending in 2016, delegates considered Spain's offer to take over as the host for 2016-2022.

Antoni Peris Mingot, President of Charter Member Sedigas, gave a presentation on the gas industry in Spain which included a video with messages of support from Spain's Minister of Industry, Energy & Tourism, José Manuel Soria, and the Chairman of Gas Natural Fenosa, Salvador Gabarró Serra.

Antoni introduced the candidate for Secretary General, Luis Bertrán Rafecas. He is currently Director of Planning and Services for the Retail Energy Market at Gas Natural Fenosa, which had offered to host the Secretariat in its headquarters in Barcelona.

Delegates accepted Spain's offer and elected Luis as Deputy Secretary General for December

◀◀ Following the Council elections, Pål Rasmussen (FAR LEFT) is now the Secretary General and Luis Bertrán Rafecas (LEFT) is the Deputy Secretary General.

1, 2014 to October 31, 2016 pending his confirmation as Secretary General in 2016. "Building on the work of the Norwegian Secretariat we will work to develop IGU's world presence," he declared.

Delegates also conferred the title of Honorary Secretary General on Torstein in recognition of his work over the past seven years. "It has been a great pleasure and a privilege to work for IGU and a highlight of my career in the gas industry," he said.

Global Voice of Gas

Jérôme asked Mel Ydreos to brief delegates on IGU's Global Voice of Gas initiative following the launch of the Global Gas Portal in May.

"We need as an industry to come together and advocate for natural gas," said Mel, who explained that the initiative is focused on three themes: Natural gas improves lives, Natural gas keeps the lights on and Natural gas drives energy solutions.

Having developed and launched the portal, an outreach programme of advertising in English, French and Mandarin was launched on June 24 and ran until July 31. It was then paused in order to analyse the results and optimise the approach before being restarted on September 15 for two months.

The outreach programme used paid search advertising on Google to pull people to the IGU website and display advertisements targeted at

▼◀ Torstein Indrebø receives a diploma in recognition of his service as Secretary General from Jérôme Ferrier and Datuk Abdul Rahim Hashim.

▼ Mel Ydreos briefs delegates on IGU's Global Voice of Gas initiative.

people viewing related or relevant content across third-party websites to push visitors to the IGU website.

Mel said that from June to just before the Council meeting, the search and display ads drove a total of 42,078 visits to the IGU website, making up 73.05% of all traffic.

The next phase is to develop an integrated government relations, public affairs and communications strategy for 2015 with particular focus on COP 21, subject to sufficient sponsorship being raised.

Global engagement

Torstein then reviewed IGU's engagement with global energy politics and cooperation with the UN and The World Bank.

"IGU is doing a lot to be more visible in global energy politics," he said, citing the Union's participation in the G20 Energy Sustainability Working Group, the IEF-IGU Ministerial Gas Forum, cooperation with the International Peace Institute through Task Force 3 – Geopolitics and the GasNaturally initiative targeted at the European Parliament and Commission.

Torstein announced that a memorandum of understanding had been signed the month before the Council meeting with Anita Marangoly George, Senior Director of the The World Bank Group's Special Practice on Energy and Extractive Industries. This will build on the longstanding cooperation between IGU and The World Bank to enhance technology and knowledge transfer.

Anita George will be speaking at WGC 2015 as will Irina Bokova, Director General of UNESCO with which IGU also has a strong cooperative relationship.

Just before lunch, delegates approved IGU's accounts for 2013, a revised budget for 2014 to increase funding for the Global Voice of Gas project and the budget for 2015.

Afternoon session

Following lunch the election for the 2018-2021 Presidency of IGU and host of the 28th World Gas Conference was held. Jérôme introduced the four candidates for President: Li Yalan, Vice President and General Manager, Beijing Gas Group, China; Rune Bjørnson, Senior Vice President Natural Gas, Statoil, Norway; Seokhyo Jang, President & CEO of KOGAS, Republic of Korea; and Alexander Medvedev, Deputy Chairman of the Management Committee of Gazprom, Russia.

Carolin explained the voting procedure and each candidate gave a 15-minute presentation including a video.

While the votes were being counted by Carolin and her fellow tellers, Immediate Past President Datuk Abdul Rahim Hashim, Honorary Secretary General Peter Storm and Honorary Member Roberto Brandt, CC Chair Georges Liens presented the progress report from the Coordination Committee and gave an update on the technical programme for WGC 2015. He said that 1,501 abstracts had been received from 65 countries (a 100% increase compared to WGC 2012), 15 keynote speakers and four luncheon speakers had been confirmed, while some 200 students and young professionals were expected at the Youth Programme.

Jérôme then announced that no candidate had achieved an overall majority so the top three would go forward to a second round.

Seokhyo Jang addresses delegates after they elected the Republic of Korea to the IGU Presidency for 2018-21.

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He thanked Rune Bjørnson and the Norwegian team for their efforts and asked China, the Republic of Korea and Russia to make final 3-minute presentations.

While the tellers counted the second round of votes, NOC Chair Daniel Paccoud added to Georges' presentation with more information on the preparations for WGC 2015. He said that between 3,500 and 4,000 delegates were expected, 15,000m^2 of exhibition space had been booked with a further 3,000m^2 under negotiation, and that the sponsorship programme was going well.

Jérôme then received the result and announced that the Republic of Korea had won. It was third time lucky for the country which had bid unsuccessfully in 2002 and 2011. Seokhyo Jang will become Vice President for 2015-2018 and President for 2018-21, with the 28th World Gas Conference being held in Daegu in 2021. Seokhyo Jang returned to the podium to say a few words. "The Korean team will do our best to serve IGU and we will continue to uphold IGU's traditions," he declared.

Following the excitement of the election, Eduardo Pizano, President of Colombia's Charter Member, Naturgas, was asked to give a short presentation on the venue for the October 2015 Council meeting, which will be held in Cartagena de Indias, Colombia.

After the coffee break there was a session on the gas industry in Germany with presentations from Dr-Ing Anke Tuscjek, Member of the General Executive Board of BDEW, an association which represents 1,800 energy and water companies, and Prof. Dr Gerald Linke of E.ON, who is the Chair of DVGW.

Dr-Ing Anke Tuscjek looked at the Energiewende (energy transition) policy to decarbonise Germany's energy supply. Although a major aim of the policy is to increase the share of renewables in the country's power generation to 80% by 2050, she pointed out that gas backs up intermittent power generation from renewables, fuels 50% of space heating and has a growing role as a transportation fuel. "Natural gas can and must play an important role in the Energiewende," she said, pointing out that security of supply is the top priority and this is underpinned in Germany by diversified supply sources, liquid trading platforms, ample gas storage capacity and a well-developed gas grid.

Prof. Dr Gerald Linke of E.ON began by giving a presentation on DVGW and German gas infrastructure, and then focused on how gas and renewables can combine their strengths to be partners. He looked at developments in sectors such as combined heat and power, biomethane, the transportation sector and, in particular, power-to-gas. Excess power at times

▸▸ Anke Tuscjek (LEFT) and Gerald Linke (FAR LEFT) giving presentations on the German gas industry.

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of peak production from wind and solar can be used to produce hydrogen through electrolysis and the hydrogen can either be stored in the gas grid, used in transport or industry, or combined with CO_2 in a methanation process. There are currently more than 20 power-to-gas pilots in Germany. "Energy integration is the most challenging task for the future," he declared.

When the session ended, Jérôme handed over to Hans Jørgen Rasmusen, the most senior honorary official present, to close the proceedings and ask for a vote of thanks for the host. The day was rounded off with a farewell dinner.

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

Introductory Meeting for Applicants

An innovation for 2014 was a special meeting to brief applicants for membership on IGU and its work prior to the Council's vote. Chaired by Pål Rasmussen, it was held on October 14 and attended by delegations from 11 of the prospective new members.

Pål began by asking a representative of each applicant present to give a short presentation on their organisation or company.

Speaking for the prospective Charter Members were: Arthur Mkhitaryan of the Union of Gas Companies of Armenia; Jassim Isa Al Shirawi of Bahrain's National Oil & Gas Authority; Aleh Hamolya of Gazprom Transgaz Belarus; Zulema Espejo Candia of Yacimientos Petrolíferos Fiscales Bolivianos; Carlos Cortes-Simon of the Natural Gas Distributors Association of Chile; and Haitham Al Ghais of Kuwait Petroleum Corporation.

The representatives who spoke for the prospective Associate Members were: Michel Charron of Bureau Veritas; Zoe Zhao of China LNG Association; Daniel Purba of the Indonesian Gas Society; Young Sik Kwon of KOGAS; and Yenni Andayani of Pertamina.

Then Pål gave an overview of IGU's organisation and work, outlined the benefits of membership and introduced the members of the Secretariat. He was followed by the CC Vice Chair, Mel Ydreos, who explained the set-up of the technical committees and task forces and talked about the Triennial Work Programme.

The meeting was opened up for questions and ended with a group photo session.

CGS 中国燃气学会 CHINA GAS SOCIETY

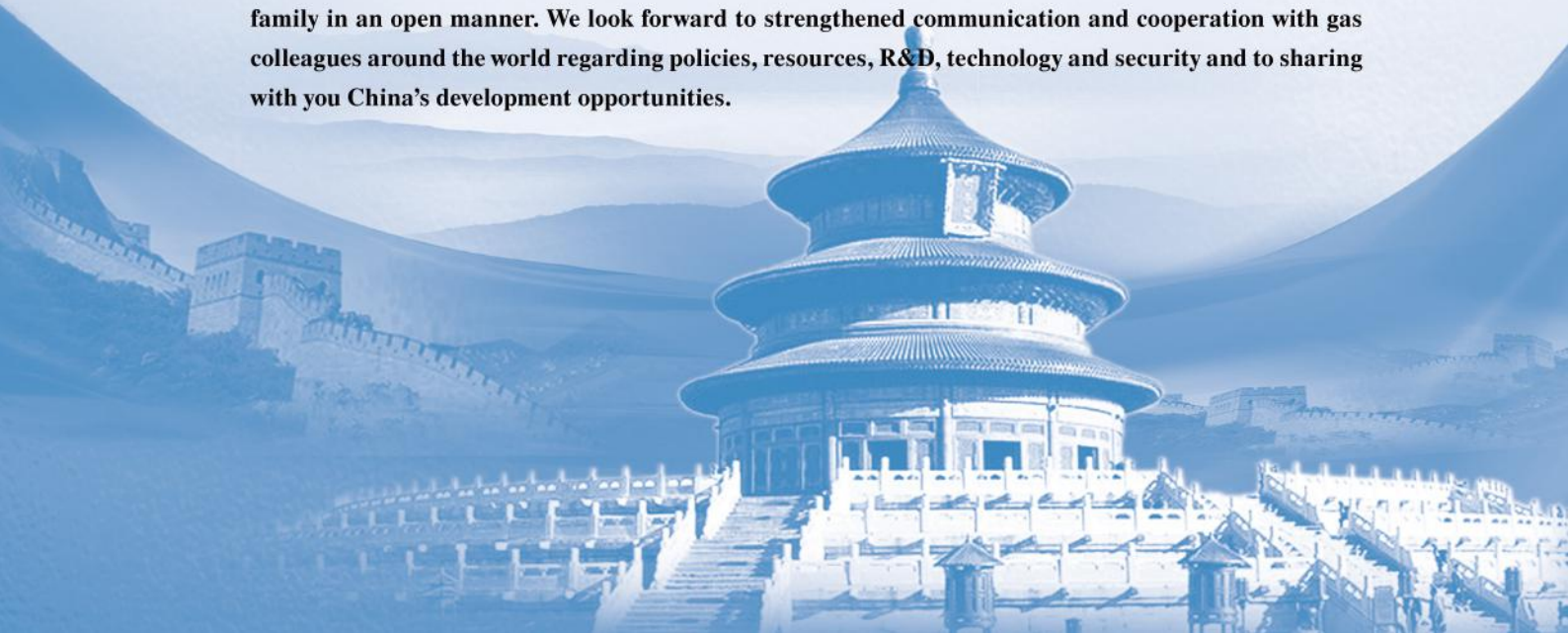
A Brief Introduction to China's Gas Industry

Since the beginning of the 21st century, with pipeline projects such as the West-to-East Gas Transmission Project and Sichuan-East Gas Transmission Project being put into operation, the natural gas industry in China has witnessed major development. A multiple gas resource supply pattern is taking shape and gas transmission and distribution systems enjoy rapid progress, contributing to a more secure and steady gas supply and greater diversification in gas applications. Gas consumption volumes have increased sharply – annual gas consumption in China has reached 167.6 billion cubic metres (bcm), accounting for 5.8% of primary energy consumption. Domestic output amounts to 117 bcm; while import volumes have reached 53 bcm, making the foreign dependency ratio 32%. The total length of gas transmission trunk line now exceeds 60,000 km. More than three million people working in over 2,000 gas companies in the upstream, midstream and downstream gas industries in China, provide services to over 240 million gas users.

Economic progress and growth in urbanisation in China have fuelled energy demand, and at the same time placed enormous pressure on the environment. In order to treat air pollution and improve citizens' quality of life, the Chinese government has highlighted enhancing ecological civilisation and building Beautiful China by focussing on green energy and low-carbon economic development. Natural gas has been identified as an important clean energy solution in these endeavours. It is estimated that by the years 2015 and 2020, gas supply volumes in China will reach 260 bcm and 400 bcm, accounting for more than 8% and 10% of primary energy consumption respectively.

With huge market potential, the gas industry in China is entering a stage of all-round development. In the next five years, natural gas demand will maintain an annual growth rate above 10%. To meet such surging demand, China will accelerate conventional and unconventional domestic gas exploration. And, based on self-sufficiency, China will further enhance resource introduction. Meanwhile, infrastructure will be expanded and new technology introduced at an accelerated rate to meet the rapid development in demand. On average an estimated 5,000 km of new gas pipeline will be constructed each year and new technologies will be brought in from overseas to further improve energy efficiency.

The world's energy industries are experiencing major transformation. As a clean, high quality, highly efficient energy resource, natural gas is playing an increasingly important role in forming a secure, stable, economic and clean energy mix for the future. The gas industry in China is also entering a stage of deepening reform and sustained development and it will be integrated into the world gas family in an open manner. We look forward to strengthened communication and cooperation with gas colleagues around the world regarding policies, resources, R&D, technology and security and to sharing with you China's development opportunities.



Ministerial Gas Forum Gets Message Across

By Khadija Al-Siyabi

Strong and effective communication is needed to promote the benefits of natural gas. In order to raise the voice of gas, it is important that different views and opinions are exchanged amongst policy makers and key influencers. Furthermore, it is essential that political, economic and environmental challenges are addressed so that natural gas can play its full role in the global energy mix.

This is why IGU and the International Energy Forum (IEF) organise a biennial Ministerial Gas Forum. The event is a platform for ministers and senior decision makers to investigate how energy policies, long-term partnership and enhanced cooperation can help to address the core challenges of energy security and sustainable economic development within a holistic energy framework. It is held under the Chatham House Rule and is by invitation only.

▼ Speakers at the 4th IEF-IGU Ministerial Forum included (*from left to right*): HE Ali bin Ibrahim Al-Naimi, Minister of Petroleum and Mineral Resources of Saudi Arabia; HE Pedro Joaquín Coldwell, Secretary of Energy of Mexico; Aldo Flores-Quiroga, IEF Secretary General; and Luis Vásquez, President of the Mexican Natural Gas Association.

The fourth IEF-IGU Ministerial Gas Forum took place in Acapulco, Mexico on November 12, 2014 with the theme "The Role of Gas in Energy Security and Sustainable Economic Development". Around 100 delegates attended including ministers, deputy ministers, ambassadors, CEOs and high-level representatives.

Proceedings began with a welcome address and opening remarks from Dr Aldo Flores-Quiroga, IEF Secretary General. He was followed by Jérôme Ferrier, IGU President, Luis Vásquez, President of the Mexican Natural Gas Association and HE Pedro Joaquín Coldwell, Secretary of Energy of Mexico.

In the opening remarks speakers highlighted the increasing demand for gas, especially in power generation, its growing share of the primary energy mix and its reliable partnership with renewables.

Although the future of gas seems to be bright, some issues are still unresolved, especially when it comes to environmental perceptions. Many people lump gas in with other fossil fuels and do not appreciate that it is the cleanest burning fossil fuel. Moreover, as demand is strongly linked to price, consumers tend to switch to cheaper, albeit more polluting fuel options.

Improving access to energy is also a major issue as more than one billion people do not have access to electricity today. Collaboration with global institutions like the United Nations and World Bank in gas-related initiatives is a good way of helping address this issue.

The Mexican speakers looked at the significant potential for development of Mexico's

gas sector and the reform of its energy market. This is now underway with the aim of attracting investment, improving productivity and reducing prices. On the gas front, the target is to increase production from 56.6 bcm (68% of consumption) in 2013 to 106 bcm by 2025 and the Mexican NOC, Pemex will be able to bring in foreign partners. On the electricity front, private companies will be able to bid for access to the grid and compete for customers instead of having to sell the electricity they generate to the former monopoly distributor, the Federal Electricity Commission (CFE). The generating sector in Mexico is also transitioning from old diesel plants to new combined-cycle gas plants, which is a good step towards shifting to a cleaner fuel option.

After the opening remarks, HE Ali bin Ibrahim Al-Naimi, Minister of Petroleum and Mineral Resources of Saudi Arabia, gave a keynote speech entitled "Gas: A View From Saudi Arabia".

Saudi Arabia is the world's leading petrochemical producer, with vast reserves of associated and non-associated gas. Currently there are no plans to export gas or get into the LNG business as priority will be given to domestic use.

Panel discussions

The forum then continued with three panel discussions. The first panel considered the role of gas in sustainable economic development and was moderated by Dr Aldo Flores-Quiroga. Discussion focused on the extent to which natural gas is a partner of renewable energy sources as opposed to a competitor; its future role in Asia as the region with the highest forecast growth; and the expected increase in the fleet of gas-fuelled vehicles.

The second panel looked at long-term investment and the LNG trade in competitive but unsettled gas markets and was moderated by Jérôme Ferrier. The main points raised concerned the current level of investment in the gas sector, constraints faced and how investment in pipeline and LNG infrastructure can facilitate regional integration. In addition, geopolitical risks as a result of the increase in international gas trading were discussed, as well as the likely impact of international trade, investment and climate agreements on LNG trade and investment.

▲ The IGU delegation at the 4th IEF-IGU Ministerial Forum included (*from left to right*): Mats Fredriksson, Pål Rasmussen and Khadija Al-Siyabi.

The final panel was dedicated to discussion of Mexico's energy market reform and its development within a global context, and was moderated by HE Pedro Joaquín Coldwell. Participants tackled the short-, medium- and long-term implications of the reformed Mexican natural gas model on domestic and international markets. They also discussed the possibility of Mexico becoming a key global player in natural gas through regional energy integration and international trade.

The forum was closed by Torstein Indrebø, IGU Secretary General at the time, and Dr Aldo Flores-Quiroga, who summarised the main points and recommendations.

Khadija Al-Siyabi is Senior Advisor in the IGU Secretariat.

Message from the Incoming President

By David C. Carroll

Hello, friends and colleagues. We in the global gas industry are indeed living in interesting times! We have a number of important challenges and opportunities to keep us busy.

Energy issues dominated the headlines in 2014, and the New Year began with the lowest global crude oil prices since 2009. The delicate balance of supply and demand has been upset by an influx of new oil and gas supplies, a sluggish worldwide economy and the commissioning of significant new infrastructure investments to enable greater levels of global energy trade.

The developing world seeks ever increasing amounts of energy to fuel a rising standard of living and opportunities for its citizens. And it needs energy to be accessible, affordable and acceptable.

The quality of our environment is of great importance to both energy producers and consumers alike. The responsible production, safe distribution and efficient usage of energy remain paramount.

And recent geopolitical events have reminded us of the critical need to maintain a diverse, resilient portfolio of energy supplies.

These topics and others will take centre stage in Paris, France this year, as the City of Light hosts both the 26th World Gas Conference (WGC) in June and the United Nations Framework Convention on Climate Change (UNFCCC) Conference of the Parties (COP 21) at the end of the year. As you know, COP 21 is focused on achieving a binding and universal agreement among all nations to mitigate and adapt to climate change.

At the conclusion of the World Gas Conference in June, the United States will

David C. Carroll: our team is well positioned to work with all of you to promote the role of gas on the international stage.

Presidency/Leadership Team

United States

Vice Presidency

Korea

IGU Secretariat

Norway 2015-2016

Spain 2016-2022

assume the Presidency of IGU. The French Presidency, under the leadership of Jérôme Ferrier, has led a productive Triennium and done a great job of raising the profile of gas and the role it plays within the global energy mix. Their Global Voice of Gas initiative has given our industry a more effective platform for developing and communicating key messages to policy makers across the globe.

They also strengthened the focus on research and innovation through events such as the IGU Research Conference (IGRC) held last September in Copenhagen. I'm sure WGC 2015 in Paris will be an equally exciting and compelling event. The U.S. team is honoured to follow the French administration and continue their good work.

Promoting the role of gas

This will be the first time since the 1985-1988 Triennium that the United States has held the Presidency of IGU and hosted the WGC, a once-in-a-generation opportunity to help the global gas industry achieve its vision for the future. Given the leading role natural gas is playing in the U.S. to meet energy needs, our team is perfectly positioned to work with all of you to promote the role of gas on the international stage.

IGU, founded in 1931, is made up of associations and corporations of the gas industry from around the world. Its growing membership includes 91 member countries and 51 associated companies, representing 97% of the world gas market. The American Gas Association, or AGA, is the U.S. Charter Member of IGU, representing hundreds of gas companies throughout the gas industry value chain and playing a key role in U.S. energy policy development as a leading advocacy organisation.

AGA will host the U.S. IGU Presidency from 2015 to 2018. I will serve as your IGU President and will be joined by key North American leaders the Hon. Dave McCurdy, President and CEO of AGA, who will serve as the Chair of the WGC 2018 National Organising Committee; and Mel Ydreos, Executive Director of Energy-Vantage, who will serve as Chair of the IGU Coordination Committee. Jay Copan will serve

Coordination Committee

Programme Committees (PGC)	*Working Committees (WOC)*	*Regional Coordinators*	*Task Forces*
Sustainability (PGC A) Argentina	**Exploration and Production** (WOC 1) Malaysia	**North America**	**Workforce Development** (TF 1) TBD
Strategy (PGC B) The Netherlands	**Storage** (WOC 2) Russia	**South America and the Caribbean**	**Strategic Communication and Outreach** (TF 2) TBD
Gas Markets (PGC C) Algeria	**Transmission** (WOC 3) Czech Republic	**Europe**	
LNG (PGC D) Japan	**Distribution** (WOC 4) Spain	**Russia, the Black Sea and the Caspian**	
Marketing and Communication (PGC E) Australia	**Utilisation** (WOC 5) Iran	**Asia and Asia-Pacific**	
R&D and Innovation (PGC F) Germany		**Africa and the Middle East**	

IGU draws on expertise from around the world.

as Executive Director of WGC 2018 and Special Advisor to the President. And we'll be supported by a number of other outstanding professionals from AGA and the broader North American gas industry.

The three primary objectives of our Presidency are to enhance the value of participation for our many IGU members, to provide an influential voice of the gas industry in the global energy debate and to close our term with an exceptional and meaningful World Gas Conference.

During the U.S. Triennium, IGU leaders will focus on educating policy makers of the importance of gas in an increasingly carbon-constrained environment. We will advocate on behalf of the global gas industry and support our members' advocacy efforts. And we will create engaging outreach campaigns to promote gas use around the world, further strengthening the brand of IGU as the Global Voice of Gas.

The first key opportunity to make sure the voice of gas is present, strong and heard will be at COP 21, a highly visible event that will attract immense interest from many stakeholder groups. Climate change can be reduced and managed through a number of adaptation and mitigation strategies, and we'll be working hard to ensure that countries' action plans resulting from this event will include natural gas as a key element of the climate change solution.

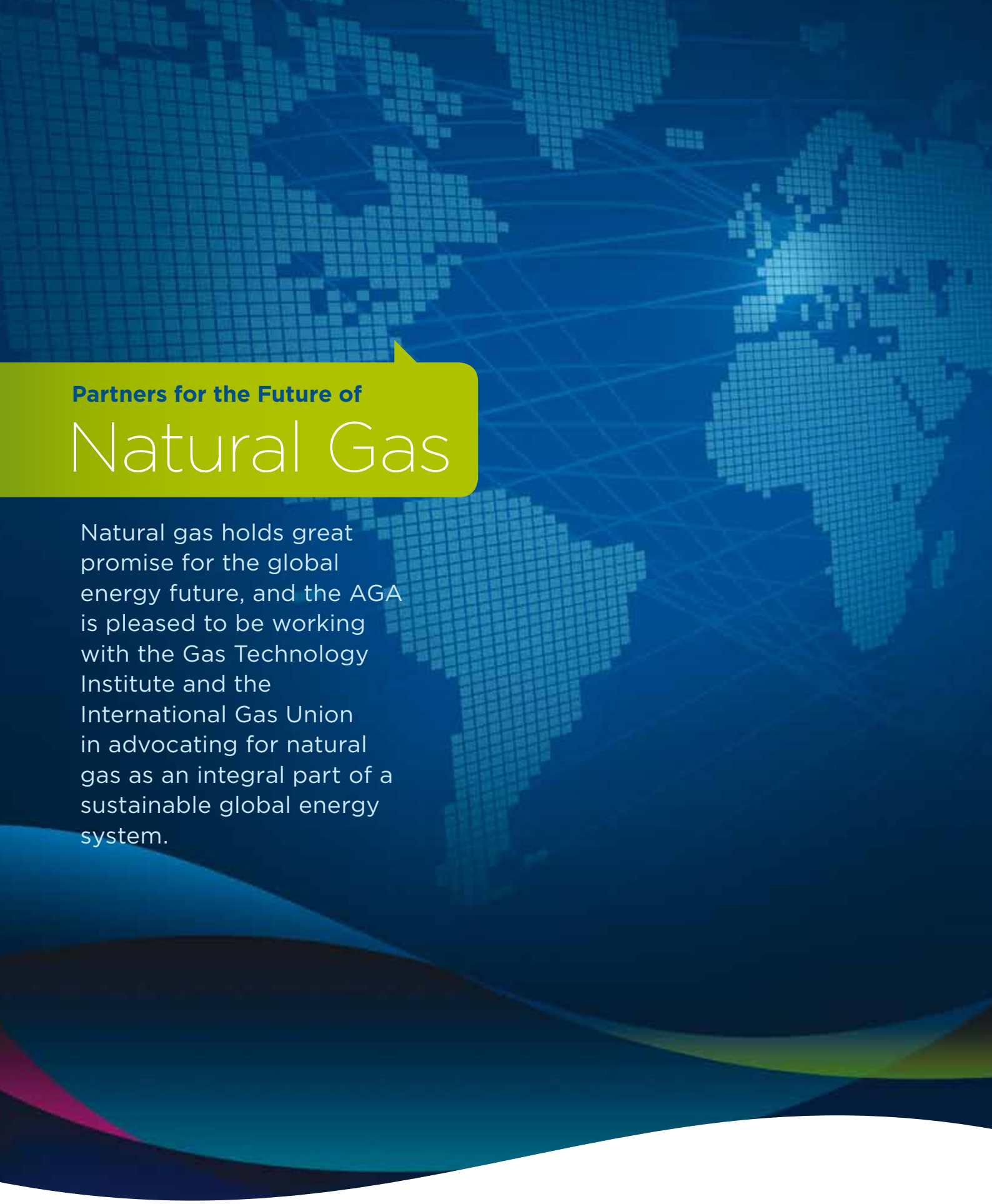
Areas of strategic importance to IGU members include ***expanded access to gas*** via development of new supplies and building out infrastructure to get these supplies to market; ***increasing market opportunities*** by encouraging demand growth through new applications and removing barriers to growth; and ***addressing social licence concerns*** such as safety and reliability, environmental impact, energy efficiency and community engagement. Our team will work with the broad IGU membership to develop tools and tactics to address these important issues.

IGU is known for its slate of prestigious gas conferences and events, and a recently conducted survey indicated that information sharing and networking are some of the most valued aspects of membership. We plan on hosting an exceptional 27th WGC in 2018 in Washington, D.C., coinciding with the 100-year anniversary of the AGA. This will be a prime location to bring together the world's energy leaders to celebrate a key milestone in the history of natural gas and highlight its benefits as the foundation of an affordable and lower-carbon energy supply.

The U.S. team is highly motivated to serve you and prepared to hit the ground running come June. We're excited about furthering the mission of the IGU and look forward to growing its global relevance and impact. We're eager to create a more prominent role for natural gas as a long-term sustainable resource for the future of humanity and our planet.

David C. Carroll is the Vice President of IGU and will become President at the close of the 26th WGC.

▼ The WGC was held in Washington, D.C. in 1955 and 1988 and will return in 2018.



Partners for the Future of

Natural Gas

Natural gas holds great promise for the global energy future, and the AGA is pleased to be working with the Gas Technology Institute and the International Gas Union in advocating for natural gas as an integral part of a sustainable global energy system.

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News from Organisations Affiliated to IGU

We start this issue's section with a contribution from the World LPG Association (WLPGA), the latest organisation to become affiliated to IGU. Then we have reports from the International Pipe Line & Offshore Contractors Association (IPLOCA), Gas Technology Institute (GTI), International Group of LNG Importers (GIIGNL), European Gas Research Group (GERG), Energy Delta Institute (EDI), NGV Global and NGV Europe.

▲ James Rockall: LPG and natural gas are complementary fuels in many respects.

"Now We're Cooking With Gas!" – The World LPG Association

By James Rockall, CEO & Managing Director

Bob Hope's 1939 radio show was the first to use the line "now we're cooking with gas". Hope used it frequently to signify all good things. The phrase was born out of the steady replacement of wood stoves with gas in the US that started in 1915. It was a piece of marketing genius, written by a former American Gas Association employee Deke Houlgate and given to Hope's team of comedy writers. Some 75 years later, the World LPG Association (WLPGA) is still working to give everyone in the world the chance to be "cooking with gas", even if they are far from a gas grid. For many, it's no joke – with more than four million people dying every year from exposure to household air pollution, access to clean-burning LPG is a matter of life and death.

Recognising the many common challenges and opportunities that we face, in September 2014 WLPGA and IGU signed an affiliation agreement whose aim is to formalise cooperation between these two organisations. This article describes the role of WLPGA and the objectives of our cooperation with IGU.

WLPGA – a unique organisation

The role of WLPGA is to promote the use of LPG to foster a cleaner, healthier and more prosperous world. As the unique body that represents this industry worldwide, we have a key responsibility to assist our members in the following areas:

- Demonstrate the benefits of LPG and inform, educate and influence all stakeholders;
- Support the development of LPG markets;
- Promote compliance with standards, good business and safety practices;
- Identify innovation and facilitate knowledge transfer.

With our organisation comprising 225 members operating in more than 125 countries across the globe, WLPGA can genuinely claim to be representative of the industry. Our staff in Paris manages a range of programmes, often leading working groups of members to achieve the association's objectives.

LPG – an exceptional energy

LPG is a mixture of propane and butane and shares many of the positive attributes of natural gas – being clean, modern energy. Where LPG differs is that its unique physical characteristics allow it be liquefied and bottled at relatively low pressures, providing it with the key value of portability. Portability allows LPG to be used in areas where natural gas has little access – mountainous regions or small island nations. It also makes LPG an ideal fuel for mobile requirements, for example automotive and leisure.

LPG and natural gas are complementary fuels in many respects. For the industrial consumer, the offer of LPG back-up to natural gas can be

very attractive, particularly where there are problems in terms of adequate availability of natural gas, low or fluctuating pressures or shifting priorities for various sectors for allocation of natural gas based on availability, price negotiations etc. Gas utilities can provide flexible, lower cost supply contracts to industrial customers when the offer of LPG back-up increases the total availability. LPG is also an ideal solution to reducing peak load demand, allowing reduced infrastructure investment.

Natural gas market development is often constrained by the lack of secure demand. This can pose a significant commercial risk to large-scale capital investment. LPG is now being used in many parts of the world as "Synthetic Natural Gas" – a blend of LPG and air that mimics the burning characteristics of natural gas yet can be installed to fuel small communities at a fraction of the cost of pipeline installation from the grid. As demand grows and customers begin to value this clean, smokeless modern energy so the commercial risks of market development reduce. In this way, LPG is a marvellous precursor to natural gas market development.

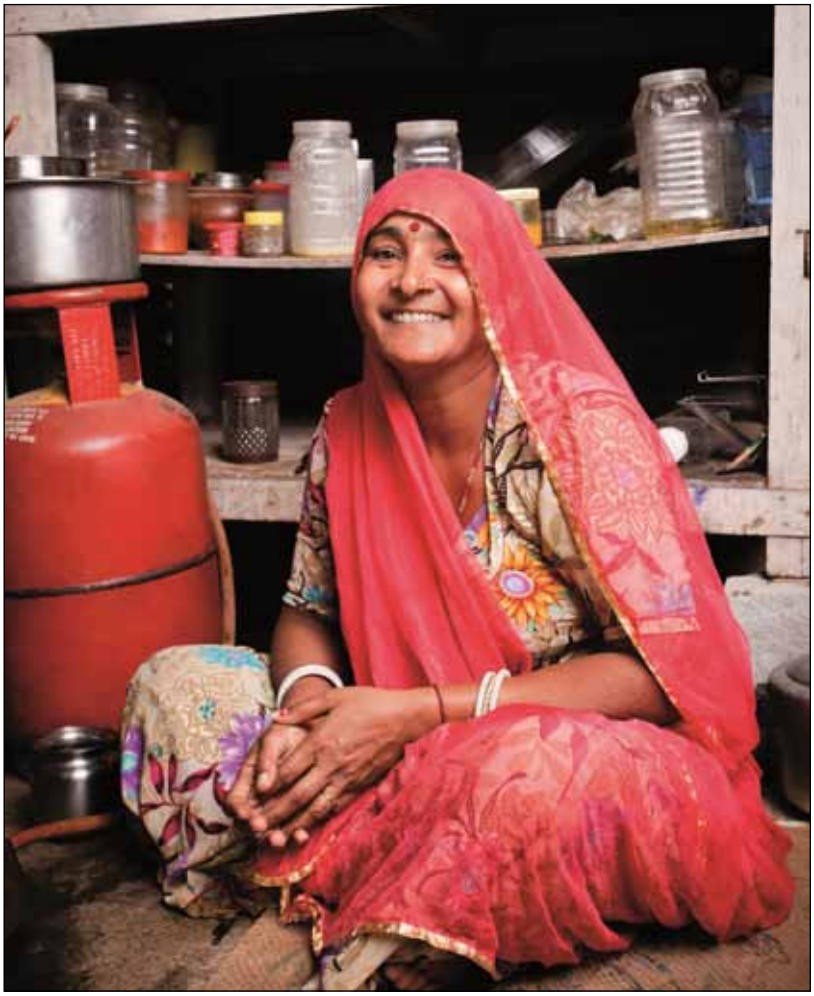
LPG can also work alongside natural gas, providing customers access to gas wherever they are, similar to public transport networks that offer rail and bus services to reach the most far flung communities.

Cooking for Life

One of the biggest opportunities WLPGA sees for LPG in the future is meeting the growing energy demands of countries that currently have no, or very limited, access to modern energy.

This opportunity is strengthened by the focus of the wider international community on improving energy access, specifically the United Nation's multi-year initiative Sustainable Energy for All which promotes access to energy in those regions currently under-served.

To coincide with this, WLPGA has launched a new campaign called Cooking for Life. This project targets facilitating the switch of one billion consumers to LPG from traditional fuels between now and 2030.



▲ WLPGA's Cooking for Life campaign aims to see one billion consumers switching to LPG by 2030.

One billion new customers between now and 2030 represents massive incremental sales of gas but also of cylinders, valves, filling plants, appliances, equipment, services and more. Not to mention the positive impact introducing LPG to these communities will have on quality of life. By switching one billion consumers to LPG, Cooking for Life will prevent the deaths of more than one million people annually.

Exceptional Energy in Action

Opportunities for growth are by no means limited to the cooking market, and it's a fact that LPG can be used in literally thousands of

applications. However, general awareness of its versatility is sometimes limited. In 2014, WLPGA launched a new website called Exceptional Energy in Action (www.lpg-apps.org). This initiative will document the many applications of LPG around the world. Even within the industry, there are many LPG applications that remain unknown and WLPGA believes a global applications database could make a huge difference to the industry to promote the literally thousands of applications, and their numerous uses, not only within the sector itself but to the world in general.

Cooperation between WLPGA and IGU

In September 2014, WLPGA and IGU reached an affiliation agreement which defined how both organisations would cooperate. It may not seem obvious why IGU and WLPGA should make such an agreement, however there are many strong reasons to do so. Both organisations promote the benefits of gas compared to other energy carriers. Those who we wish to influence, whether they are policy makers or consumers, need to understand the benefits that use of gas, whether it be natural gas or LPG, can bring. Although at first sight the two fuels could be seen to be competitive, the reality is that we are more complementary. Where natural gas does not exist, for example for economic or geographic reasons, LPG can offer a very similar customer value proposition. Both organisations manage various committees of members to address the opportunities and challenges that we face – many of them are common.

Under the agreement IGU has become an "observer member" of WLPGA while WLPGA has become an organisation "affiliated to IGU". The agreement envisages the representation and active participation of representatives from both IGU and WLPGA in relevant committees of each organisation. Each of IGU and WLPGA may report on the activities of the other in their publications, websites and other media.

This agreement has recently been made and we look forward to realising the benefits of cooperation in the years to come. One immediate example of this closer relationship is the involvement of WLPGA at the 2015 World Gas Conference in Paris where the LPG industry will be showcased at a dedicated LPG Village in the main exhibition. If you attend this event, make sure you stop by and understand what it means to be Cooking with Gas!

James Rockall is the CEO & Managing Director of the World LPG Association (www.wlpga.org).

IPLOCA

By Juan Arzuaga

More than 620 delegates attended the International Pipe Line & Offshore Contractors Association (IPLOCA) Convention – the 48th Annual – which was held in Abu Dhabi, UAE, October 13-17, 2014.

During the Convention the Association elected its Board of Directors for 2014 to 2015. The following were named to positions on the Board:

Officers

President of IPLOCA and Director for Europe Mediterranean: Jean-Claude Van de Wiele (Spiecapag);
1st Vice President and Director for East & Far East: Atul Punj (Punj Lloyd Group);
2nd Vice President and Director for Latin America: Rubén Kuri (Arendal);
Treasurer and Director for Europe Central: Harald Dresp (Max Streicher);
Immediate Past President: Najib Khoury (CCC).

Regional Directors

Director for Europe Central: Mesut Sahin (Technip);
Directors for Europe Eastern: Haldun Iyidil (Limak) and Iosif Panchak (Stroygazmontazh);
Director for Europe Mediterranean: Roberto Castelli (Bonatti);

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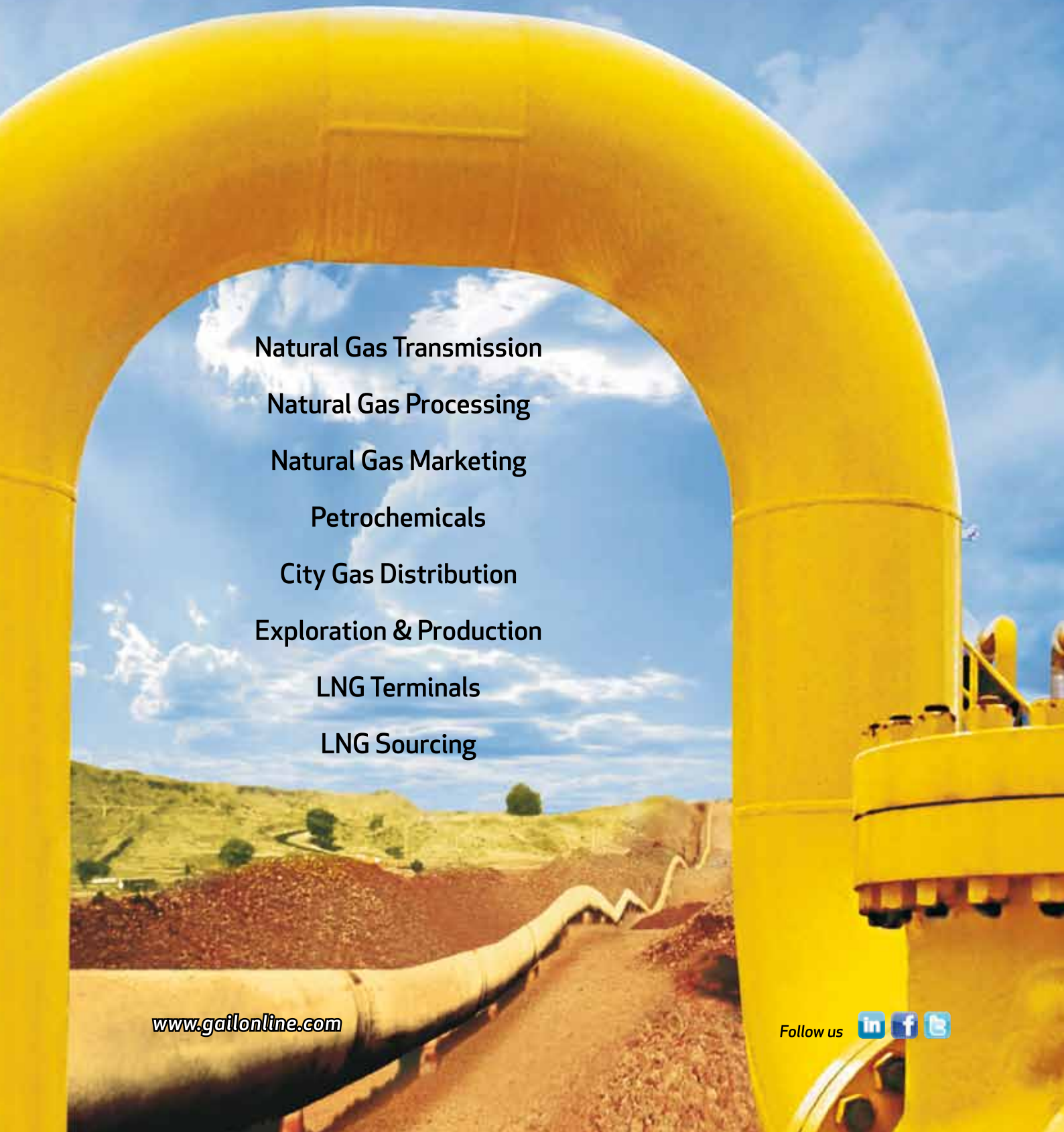

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▲ IPLOCA's Board of Directors for 2014-2015. *From left to right in the front row are:* Harald Dresp, Najib Khoury, Atul Punj, Jean-Claude Van de Wiele, Ruben Kuri and Juan Arzuaga;

Second row: Iosif Panchak, Aqeel Madhi, Georges Hage, Ibrahim Zakhem, Mesut Sahin and Roberto Castelli;

Third row: Jan Koop, Bruno Maerten, Ebbo Laenge, Andrew Ball and Gerry Grothe;

Fourth row: Adam Wynne Hughes, Larry Bolander, Haldun Iyidil, John Tikkanen and Jim Frith;

Fifth row: Marco Januzzi, Steve Sumner and Doug Evans;

Not present: Wilhelm Maats.

Directors for Europe North-West: Andrew Ball (Land and Marine) and Jan Koop (Bohlen-Doyen);
Directors for America North: Larry Bolander (Fluor) and John Tikkanen (Shawcor);
Director for Latin America: Ebbo Laenge (Conduto);
Directors for Middle East & Africa: Georges Hage (The C.A.T. Group) and Aqeel Madhi (NPCC);
Director for East & Far East: Jim Frith (McConnell Dowell).

Directors for Associate Members
Gerry Grothe (PipeLine Machinery), Marco Jannuzzi (Caterpillar), Steve Sumner (Lincoln Electric).

Directors-at-Large
Doug Evans (Gulf Interstate Engineering); Wilhelm Maats (Maats Pipeline Equipment); Bruno Maerten (GEOCEAN); Adam Wynne Hughes (Pipeline Induction Heat); Ibrahim Zakhem (Zakhem International Construction).

Guest speakers gave presentations at the Open General Meetings as follows:

- John Attrill, Project General Manager, BP, *Breaking Ground on the Southern Gas Corridor to Europe*;
- Robert Jones, Senior Vice President – Major Projects, TransCanada, *TransCanada in Mexico: Past, Present and Future;*
- HE Sheikh Nahayan Mabarak Al-Nahayan, Minister of Culture, Youth and Community Development, Abu Dhabi, *Abu Dhabi*;
- Scott Critchfield, Technical Manager – PNG LNG Project, ExxonMobil, *The PNG LNG Project: Delivering an LNG Project in a Complex Environment*;
- Mark Barrows, Operations Manager, MCJV and Zahi Ghantous, Project Manager, MCJV, *The Australia Pacific LNG Pipeline Difference*

– *A reflection on the success factors*;

- Edward Heerema, President, Allseas Group S.A., *Allseas' Single-Lift Ship "Pieter Schelte"*;
- Loek Vreenegoor, General Manager Pipelines, Flow Assurance & Subsea, Shell, *Green Infrastructure*;
- Greg Kenney, Vice President, Spectra Energy and Pierre Bechelany, Senior Vice President, Pipeline & LNG, Fluor, *Spectra Energy: Westcoast Gas Transmission Pipeline*.

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

IPLOCA Health & Safety Award, sponsored by Chevron

The Award is in recognition of members' initiatives, all of which are aimed at improving the health and safety of the pipeline industry.

The award was presented by Bruno Maerten, Chairman of the IPLOCA HSE Committee to Saipem S.p.A. in recognition of their great "Leading Behaviour" campaign.

Also recognised as runners-up, were J. Murphy & Sons Limited for the "Murphy Culture Development Programme", Nacap Australia Pty Ltd for their "Plant Assessor" and their "Journey Management System" initiatives and Spiecapag for their "Removal Guardrail for Sidebooms and Tractors" initiative.

IPLOCA Environmental Award, sponsored by Shell

The Award is presented in recognition of a significant achievement in reducing the impact on the environment for the construction of pipeline projects.

Loek Vreenegoor of Shell and Bruno Maerten, Chairman of the IPLOCA HSE Committee, presented the award to Heerema Marine Contractors Nederland BV, in recognition of their "Noise Mitigation during Pile Driving" initiative. Three runners-up were also named: ALSA Engineering & Construction Co., L.L.C. for their "Save Water, Save Life" initiative, Max Streicher GmbH & Co. KG aA for their "Optimisation of Production Processes to Reduce Environmental Impacts" and Techint Engineering and Construction for their "Organic Pool Project".

The IPLOCA 2015 Convention – the 49th Annual – will take place in Singapore, October 5-9.

Juan Arzuaga is the Executive Secretary of IPLOCA (www.iploca.com).

In the presentation of IPLOCA's Health & Safety Award for 2014 are (*from left to right*): Daslav Brkic, Andrea Forzan and Rocco Sainato from Saipem; Bruno Maerten, Chairman of the IPLOCA HSE Committee; Bruno Pomaré from Spiecapag; Andrew Ball representing J. Murphy & Sons Ltd; and Mark Twycross representing Nacap Australia Pty Ltd.

Municipal Assessment of Clean Energy Options Using Natural Gas

By Eddie Johnston

Substitution of natural gas for coal and fuel oil along with integration of advanced building energy efficiency strategies, distributed energy resources and renewable energy technologies in existing and new community design and development can offer cost-effective solutions to many of the most pressing energy and electric power problems.

The Gas Technology Institute's (GTI) researchers investigate energy from a viewpoint based in science, regulatory and market realities to help shape the air quality and carbon footprint of communities. We provide factual data essential to help address energy and environmental concerns, reduce energy demand and lower carbon emissions, helping public entities achieve their policy objectives in a cost-effective manner.

GTI has specialised technical expertise and strong analytical capabilities, and can perform energy modelling and benefit/cost analysis that allow for assessments of how new energy technologies and pathways can bring about market transformation and meet public policy goals.

GTI can complement unbiased and credible technical data with social science research to help identify potential institutional (legislative and regulatory) and market barriers to adoption of new energy efficiency or environmental solutions.

GTI has contributed to major sustainable community planning initiatives, providing energy modelling analysis and knowledge-based tools and guidelines that help cities effectively manage growth in ways that optimise energy use and minimise adverse environmental impacts.

Success stories – Chula Vista

GTI worked with the Community Development Department of the City of Chula Vista, the California Energy Commission and other par-

The Los Vecinos multi-family housing development in Chula Vista has won two LEED awards.

tners to assist in the development of several energy-efficient communities within Chula Vista's redevelopment area.

After extensive modelling and a benefit/cost analysis of energy-efficient building material and equipment options, GTI identified a set of economically feasible energy efficiency upgrades for a green affordable housing community.

This community exceeded California's strict energy code by 43%, reduced energy and water costs, was awarded Leadership in Energy & Environmental Design (LEED) Platinum Certification – the highest distinction for green buildings – and also received the LEED for Homes Outstanding Multifamily Project Award.

Success stories – China

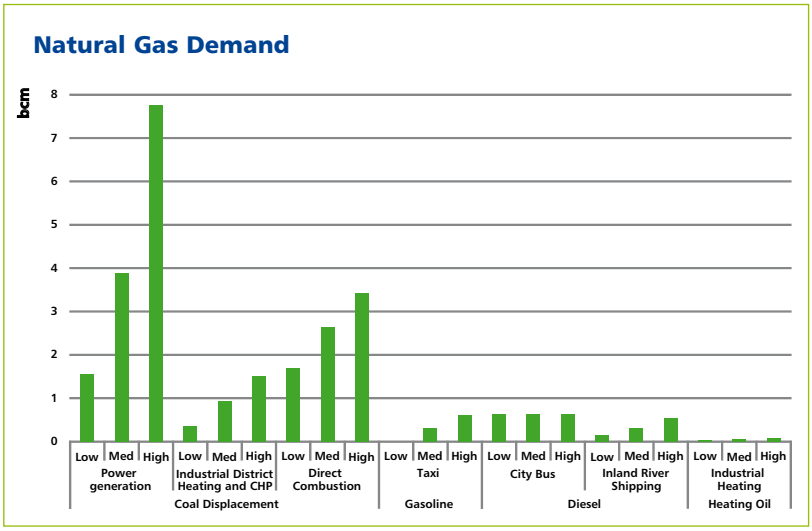
In 2014, an executive from a state-owned energy research institution in China spent six months at GTI as part of a technical exchange and R&D project focused on building a cleaner community using natural gas. Working with GTI subject matter experts, the team crafted an emissions reduction strategy and plan document that addresses the challenging air quality concerns of a major metropolitan region in China.

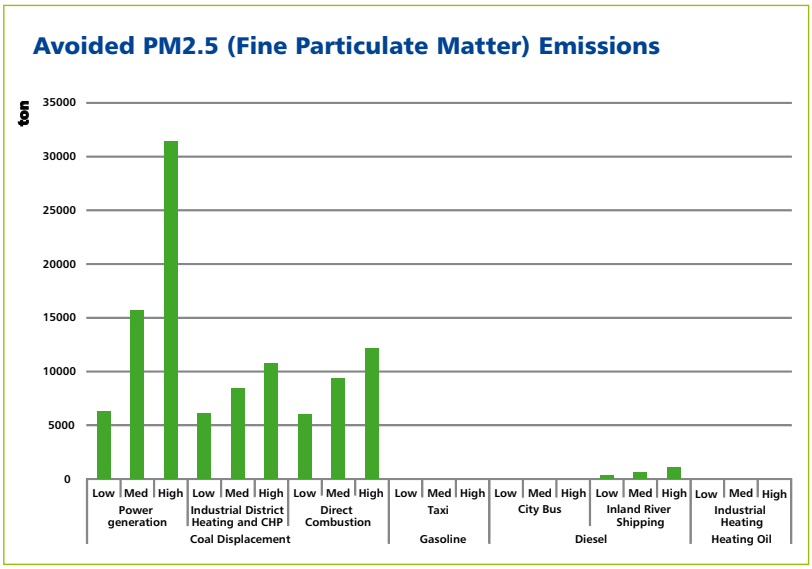
Leveraging a deep knowledge base of the trends, characteristics and activities in the country, the team built the core elements of the report using proprietary energy models, and used the outcomes in combination with a rich collection of case studies to evaluate the emission reduction benefits of using natural gas to displace coal and fuel oil in a variety of industrial and commercial applications.

The effort targeted the selective displacement of coal and heavy liquid fuels with natural gas for power generation, manufacturing, transportation and other applications. An analytical model was developed to serve as a tool for benefit/cost and scenario analyses that fed into the strategy and plan to reduce emissions using various natural gas technologies and products.

The report will be used to work with government and other stakeholders to develop and implement a long-term emission reduction strategy using various control and incentive mechanisms.

Eddie Johnston is GTI Vice President of Research Operations. For more information on how you can work with GTI to assess how the use of natural gas in your municipality can lead to a cleaner environment, contact him at +1 847 768 0889; edward.johnston@gastechnology.org.





▼ These two charts give an example of the potential emission reduction benefit and natural gas demand impact from displacing coal, gasoline, and diesel fuel in a number of sectors including power generation, industrial heating and public road transportation. For each sector defined in the study, three different fuel displacement scenarios were developed (Low, Medium and High), based on existing fuel consumption characteristics.

The Impact of Including Methane Number in Natural Gas Regulation

By José A. Lana and Secil Torun

The increasing use of NGVs has prompted moves to regulate the methane number of natural gas. The International Group of LNG Importers (GIIGNL) has developed a position paper to describe methane number and the possible impact on the LNG market of a future regulation/specification for this parameter which is linked to natural gas quality. Here we present the main points.

The global fleet of NGVs is estimated at around 17.7 million. The environmental benefits of using cleaner-burning natural gas mean that this number is set to grow.

In the USA alone, according to forecasts from the US Energy Information Agency, the use of natural gas as a transportation fuel will grow at an annual average rate of 11.9% between 2011 and 2040, although this will represent only 3.3% of natural gas consumption in the country at the end of the period.

Traditionally the focus in terms of specifications for natural gas has been on properties such as calorific value and Wobbe Index. With the increased use of natural gas as a transportation fuel, other properties are starting to be considered due to their importance for internal combustion engines. The main one is methane number which is the measure of resistance of fuel gases to engine knock, also known as detonation. Detonation is produced by the auto-ignition of the fuel/air mixture ahead of the propagating flame; this phenomenon produces some shock waves that could lead to serious loss of power (efficiency) and damage to the engine. It is similar to the octane number for petrol engines.

A methane number is assigned to natural gas based upon operation in a knock testing unit at the same standard knock intensity. The references used are:

- Pure methane is assigned as the knock resistant reference fuel with a methane number of 100;
- Pure hydrogen is used as the knock sensitive reference fuel with a methane number of 0.

Unlike other properties of natural gas, methane number is not a thermodynamic property of gas, so equations of state cannot be used to calculate it from its composition. There are several standards and engine manufacturer methods describing calculation models for the methane number of natural gas, but there are two main issues regarding them:

- All are based on experimental measurements in synthetic gases where only hydrocarbons up to C4 were used. To consider higher hydrocarbons, they are usually added to the C4 fraction in different ways.
- The results of the various models are different to each other. This difference can be higher than 5 depending on the LNG composition (origin) and with no clear trend amongst them in the results.

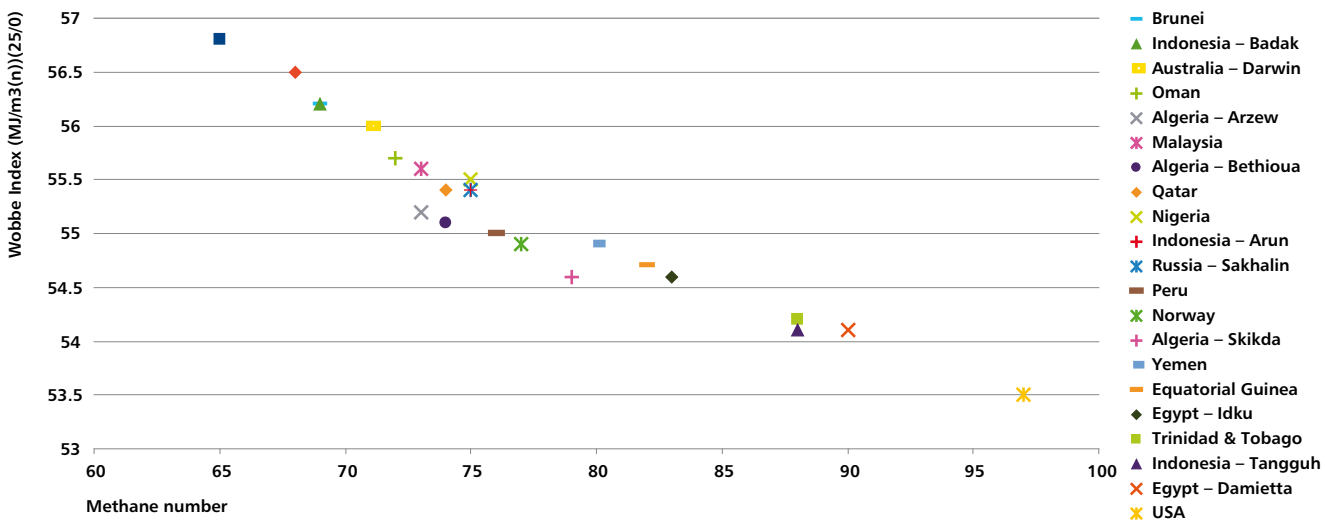
In any case, no official regulation which states a minimum value for the methane number of natural gas has been identified.

The most serious trial to regulate the methane number is the one underway to harmonise the quality of natural gas and biomethane in the European Union, covered by Mandates M/400 and M/475 from the European Commission to the European Committee for Standardization (CEN), respectively. The Commission's aim is that the standards developed will become mandatory for EU countries in order to promote and facilitate natural gas trade between them. In these standards a minimum value for the methane number of 65 might be fixed, although for the utilisation as vehicle fuel two grades are defined: grade X, MN = 65 and grade Y, MN = 80.

Methane number in LNG supplies

Figure 1 shows the relationship between Wobbe Index and methane number of LNG from different liquefaction sites. The results are

Methane Number vs Wobbe Index of LNG from Different Suppliers



Note: Based on average composition for 2013 and MWM calculation method.

▲ Figure 1.

based on GIIGNL's 2013[1] average LNG composition data using a calculation method for the methane number developed by MWM (the one proposed for the European standard under development). It is possible to see the following:

- There is a relation between Wobbe Index and methane number, the richer/heavier the LNG the lower the methane number;
- If the methane number of natural gas is fixed at 65, nearly all the commercial LNG supplies will fulfil the requirement;
- If the methane number of natural gas is fixed at 80, a great number of LNG supplies will not fulfil the requirement.

The effect on LNG trade is summarised in *Table 1*, produced using data for 2013 from the GIIGNL report.

Adjusting the methane number of natural gas/LNG

Adjusting the methane number of natural gas is not an easy task for LNG import terminals.

In contrast to adjustment of the calorific value or Wobbe Index of natural gas, where adding nitrogen or LPG could be enough, the only effective way to increase the methane number is by removing heavy hydrocarbons from LNG. Some European terminals originally had fractionation units to separate heavy hydrocarbons from LNG, but they were dismantled more than 20 years ago because the LNG received fulfilled national regulations and the proportion of heavy components was so low (due to changes in liquefaction processes at export sites) that it was not profitable to operate them.

Another option for supplying markets setting a high methane number is to manage the LNG

◀ Table 1.

LNG Trade Affected by Different Limits for Methane Number

Methane number	*Trade below MN (Mton)*	*Trade affected (%)*
65	0	0%
70	7.01	3%
75	151.74	66%
80	204.55	88%

1 GIIGNL, *The LNG Industry 2013*, April 2014.

▲ It is important to ensure security of supply and access of LNG to markets.

supplies with the desired methane number. This requires there to be sufficient tanks at the terminal to do this, a regular supply of this type of LNG and the existence of a national regulation allowing this kind of service.

Position of GIIGNL

A methane number of 80, as recommended by some organisations in Europe, would endanger LNG supply to the market, limiting acceptable LNG sources, or would require expensive gas treatment for the benefit of NGVs – a small, albeit growing, sector of the market.

Including methane number in the standards and/or regulations requires an agreed, public and reliable method for its determination. It is not clear if such a method exists at this moment. Moreover, most of the current methods have been developed based on tests which do not take into account the presence of hydrocarbons heavier than butane.

There is an additional factor that affects the whole natural gas industry and not just the LNG sector: a high methane number will limit or prevent the injection of hydrogen into the gas grid. Using surplus renewable energy to produce hydrogen by electrolysis and injecting it into the gas grid is seen, in the medium/long term, as a promising way of storing energy and demonstrates how natural gas and renewables can be complementary.

As a consequence of the above mentioned arguments there are reasons for not including methane number in regulations and standards. However, if it is to be included then the maximum number in the standard needs to be 65, in order to ensure security of supply and access of LNG to markets.

In addition, an agreed, public and reliable method for its determination should be a prerequisite for standardisation.

In the long term, if there is a market for natural gas with a high methane number, this may be an opportunity for LNG terminals able to adjust or manage supplies to the desired methane number.

José A. Lana of Enagás is a member and Secil Torun of GDF Suez is the Chair of GIIGNL's Technical Study Group. For more information and copies of the full position paper, visit www.giignl.org.

GIIGNL is the worldwide association of the LNG importers. Founded in 1971, its membership has grown to 75 companies worldwide, comprising nearly all companies active in LNG imports or in the operation of LNG terminals. As a non-profit organisation, its resources come only from membership fees. The association constitutes a forum for exchange of experience among its members, with a view to enhance the safety, reliability and efficiency of LNG imports.

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GERG Academic Network Event Reaches Record Audience at IGRC 2014

By Robert Judd

In 2008, GERG, the European Gas Research Group formed the GERG Academic Network as a means of bringing the European gas industry closer to the academic community of researchers.

The broad objectives of the Network are to:

- Ensure that the academic community is aware of gas industry R&D issues;
- Encourage a dialogue between experts in industry and academia;
- Provide a privileged view of gas industry R&D activities;
- Show post-graduates that the gas industry offers challenging and rewarding careers;
- Harness and direct the ideas of the brightest of the new generation of our innovation community to meet the challenges of a complex energy future.

It also serves to demonstrate that:

- Technology in the gas industry advances to keep it at the heart of the energy system;
- There is leading edge R&D to be done to take the global industry into a challenging and changing future;
- The gas industry can harness all its resources to play a key role in a low carbon future.

Each year since 2008, GERG has organised and run the Academic Network event either as a stand-alone conference in Brussels or as part of a larger conference of industry attendees. Each year we put out a call to the European academic community, in particular post-graduate researchers involved in relevant research projects, to submit their work for presentation at the event. The GERG industrial community then selects up to 20 of the most relevant, innovative and promising R&D papers for presentation. The event is always over-subscribed. GERG contributes directly to the cost of the postgraduate and their supervisor's attendance at the event. We also award cash prizes to the top three posters after an evaluation exercise during the event itself.

In September 2014, GERG gave its academic community the chance to present and be visible on its first global stage. The 6th GERG Academic Network event was held at the IGU Research Conference in Copenhagen, and reached its largest-ever audience with over 500 delegates in attendance from the world's gas research community.

The event took centre stage with a great location outside the main lecture hall, adjacent to the coffee and lunch area, thus ensuring a high footfall. This time the event was held as a series of poster sessions within the conference, and all the students were able to enjoy in-depth discussions about their research with the major players in the international gas R&D community. This also allowed them to compare the challenges facing Europe and its energy transition with the often different challenges of the global community.

After an assessment exercise by a number of GERG senior representatives, prizes were awarded as follows:

Anton Verbeek from Twente University won first prize at the 6th GERG Academic Network event.

The third Eurasia Dialogue was held in December 2014 in Moscow.

- First prize and €3,000 was awarded to Anton Verbeek, Twente University, for his paper on "Efficient turbulence enhancing low swirl combustion".
- Second prize and €2,000 was awarded to Bjørn Morland, Oslo University, for presenting "Are the safe CCS transport recommendations safe?"
- Third prize and €1,000 was jointly awarded to two students:
  Ashish Shah, Lund University, for Pre-chamber ignition systems for heavy duty engines" and Andras Perl, Hanze University, for "Methane storage on porous activated carbons".

Abstracts of the all 17 papers can be found on the GERG website. A quick browse through the abstracts shows that the new research generation is embracing the challenge faced by gas as it develops its role in a sustainable energy system.

Congratulations to the prizewinners and also to all the students who took the effort to prepare their posters, attend the event and discuss their work with the international community. GERG thanks IGU and the conference organisers, particularly our ex-President Peter Hinstrup for this great opportunity to showcase future talent. We all look forward to the next GERG Academic Network event, which will take place in November at the European Gas Technology Conference (EGATEC 2015) in Vienna.

Robert Judd is the Secretary General of GERG (www.gerg.eu). For more information on EGATEC visit www.egatec2015.com.

Third Eurasia Dialogue: New Energy Realities?

By Aliona Duca

The unfolding Ukrainian political and energy crisis is impacting the geopolitical relations between Russia and the EU. Yet, it should not be forgotten that Russia remains the major energy supplier to Western Europe. Moreover, due to existing contractual obligations, declining EU production of natural gas, infrastructural and price issues, there is limited scope for a significant reduction of European dependence on Russian gas before the mid-2020s. Therefore, it is essential to maintain a continued and prosperous energy relationship between these two parties.

With its wide range of business partners, Energy Delta Institute (EDI) plays a significant role in bringing parties from East and West together in order to support the relationship between Russia and European states. That is

also one of the reasons why EDI together with its knowledge partner, the Institute of World Economy and International Relations (IMEMO) organises an annual high-profile energy event, called Eurasia Dialogue. This takes place in Moscow, Russia, and its main goal is to connect businesses, academia and research institutions connected with the West European and Russian oil and gas sectors, in order to exchange their knowledge and experiences of the most highly-debated topics within the energy industry.

The third Eurasia Dialogue was held on December 11, 2014 with the theme "Global Gas Trends" and focused on the role of natural gas in Western European and Russian energy markets. Three main subjects were debated, namely: the future role of gas in the global energy mix and security of demand; energy innovation; and global LNG markets. Being an energy analyst at EDI, I had the opportunity to attend this event and interview some of the leading experts on these topics, such as Simon Blakey and Vitaliy Yermakov of IHS, Tatiana Mitrova of the Energy Research Institute of the Russian Academy of Sciences, Ad van Wijk of Delft University of Technology and Thierry Bros of Société Générale.

EDI was very pleased that the atmosphere of the event was warm and the synergy among the participants open and hospitable, even though political relations between East and West currently remain challenging.

The theme of the future role of gas is particularly relevant for Europe and Russia. The gradually decreasing demand for natural gas in Western Europe, as a result of the financial crisis, development of renewable sources of energy generation, more energy-efficient economies and low prices of coal, has led to Russia adopting new diversification strategies to discover additional markets, China in particular. A contract has been agreed to begin exports in 2018 and a framework agreement has also been signed for a second deal. The firm deal will see about 38 bcm/year of Russian gas flowing to China, which will add to existing contracts for pipeline gas from Central Asia and Myanmar and LNG imports. This means that the Chinese market is practically fully contracted until around 2023. The impact of the Chinese-Russian gas deal on European customers could be limited as they will benefit from diversification of other supply sources, for example LNG. It is predicted that the potential additional supply of LNG from the USA will result in stiffer competition on the global LNG market leading to highly competitive prices.

Meanwhile, a fundamental shift towards renewables is currently taking place in a number of EU countries. In addition, in the next couple of decades some Western European countries will face the closure of old coal-fired power plants in order to reach emission targets and of nuclear plants following the Fukushima Daiichi disaster. In that case, the long-term contractual obligations for natural gas between Russia and the EU will still provide the security of supply for European customers, while natural gas can play an important role as a back-up for intermittent power generation from wind and solar.

Last but not least, the role and aspirations of Turkey as an energy transit country for Europe have received a lot of attention recently. The Turkish Stream pipeline project between Russia and Turkey seems to be an economically rational alternative to the cancelled South Stream project. Moreover, the geographically strategic position of Turkey has significant consequences for future flows of Russian gas across Europe and possibly the creation of a new gas hub at the Turkish border.

To sum up, the main message of the third Eurasia Dialogue is that the European-Russian natural gas relationship has proven itself over the decades. Both sides recognise the political pressure and preserve their relationship, in order to successfully maintain the commercial dialogue. The old dynamics of energy markets are changing drastically. The liberalised

European energy market has created a highly competitive commodity market in Europe; however, the shift towards short-term contracts raises new challenges regarding investments in infrastructure and access to the energy market. This transition will require new business models and enhanced governmental involvement in the future.

New courses

As a result of the ongoing changes in the energy industry, EDI is introducing a Mini MBA programme entitled "New Energy Realities". This programme will address the major challenges for today's energy industry: new business models, finance and leadership. It aims to prepare future industry leaders for the changes, enabling them to chart their companies' course through a market facing unprecedented turbulence. In addition, two new Master Classes are planned: European Gas Hubs and Gas Trading and Portfolio Management.

The Golden Age of Gas is not over yet and EDI will help energy professionals to face the challenging future of the energy industry by introducing disciplines and knowledge that are essential for international gas markets.

Aliona Duca is an energy analyst with the Energy Delta Institute (www.energydelta.org).

Natural Gas for Transportation Village at WGC 2015

By David Perry and Puya Sepahzad

The 26th World Gas Conference will mark the rising importance of natural gas as a fuel for transportation by inaugurating a "Natural Gas for Transportation Village" – a first for WGC events. Launching the initiative in 2014, WGCPARIS2015 Executive Director, Daniel Paccoud and NGV Global Executive Director, Diego Goldin, said that the objective was to both recognise and raise the profile of this rapidly growing fuel sector.

▲ EDI President, Eric Dam (*second left*) with panellists during the third Eurasia Dialogue.

"The new Natural Gas for Transportation Village will be on the floor of the WGCPARIS2015 exhibition and include a seminar stage with a free-to-attend programme providing additional education opportunities specifically targeting on-road, off-road, marine and rail applications, while exhibitors servicing this sector will be grouped together in the village", said Mr Paccoud.

With energy policies weighing in heavily towards a carbon-constrained future, natural

▼ LNG fuel systems deliver marine power when and where needed.

▲ LNG as a fuel for heavy-duty transport is gaining ground in Europe – supermarketeer Lidl operates Italy's largest LNG fleet.

gas is emerging as a forerunner as it is the cleanest fossil fuel available today.

"Within the extensive WGCPARIS2015 conference programme we already address a range of topics relevant to the natural gas vehicle sector, including natural gas vehicles' environmental role, LNG as an alternative fuel, additional uses for natural gas, the role of biomethane (a renewable natural gas) etc.", Mr Paccoud added.

As co-host of the village, NGV Global is working with its regional affiliated association NGVA Europe and membership of both associations to develop the free seminars, including managing the call for topics and hosting the sessions.

"By creating a special seminar focusing on NGVs, we will be able to present the latest developments, opportunities and challenges for the sector, with our call for topics covering technical, commercial and strategic areas," said Mr Goldin. "A diverse range of topics will be addressed including the latest in vehicle applications, stations, safety and CNG, LNG and biomethane dispensing systems including those used for marine bunkering."

Secretary General of NGVA Europe, Lennart Pilskog, highlighted the cooperation between the European natural gas vehicle association and NGV Global with regard to the seminar activities. "This joint effort is further proof of a new chapter of close collaboration between the two associations. The initiative allows Europe to strengthen the strategic and operative ties with a global perspective," he said.

Mr Pilskog moreover emphasised the opportunities offered by the collaboration between the NGV associations and IGU for the exhibition at WGCPARIS2015: "To have the Natural Gas for Transportation Village embedded in the major event of the global gas industry is a unique chance to meet the key decision makers, allowing the gas and vehicle industry to cross-link and create synergies."

NGVA Europe is looking very confidently towards 2015, as a major breakthrough for the market development was achieved recently at political level. In November 2014, the EU Directive 2014/94/EU on the deployment of alternative fuels infrastructure entered into force, requiring Member States to create coverage of CNG refuelling points in cities by 2020. Five years later, Europe's main transport corridors shall be covered with filling stations for both CNG and LNG. By 2030, refuelling infrastructure for LNG needs to be available in main harbours and inland waterways.

The needed investment support is given through the EU's Connecting Europe Facility (CEF) by means of €26 billion (almost $30 billion) of funding for transport infrastructure development during 2014-2020. This includes support for the distribution of both natural gas and biomethane and NGVA Europe expects the development of Europe's gas refuelling network to pick up pace in 2015.

Moreover, stricter limits for the sulphur content of ship fuel used in key European waterways, in force since January 1, 2015, will cause marine transport to partly switch to LNG, because natural gas reduces emissions of sulphur drastically, besides other pollutants. This is an opportunity for natural gas in all transport modes, as gas infrastructure for mobility on roads and waterways is complementary.

LNG as a fuel for heavy-duty transport is also increasingly gaining ground in Europe. Key countries like Spain, UK, The Netherlands and Sweden have increased their LNG truck fleets, fostered by the fact that several new LNG trucks models now fulfil the stricter Euro VI emission standards. In this context, a signal effect is expected from the ongoing LNG Blue Corridors project, an initiative by NGVA Europe, which has opened five new filling stations for LNG and is on track to reach its aim of demonstrating that trucks are able to cross Europe running on LNG.

Pavilion at LNG 17

Exhibitions and Trade Fairs (ETF) is the appointed exhibition organiser for WGCPARIS2015, including the Natural Gas for Transportation Village. Most recently ETF managed the exhibitions for the 25th World Gas Conference in Kuala Lumpur in 2012, as well as LNG 17 in Houston in 2013.

"In 2013, ETF implemented an LNG for Transportation Pavilion within LNG 17 Houston, with NGV Global co-hosting the Pavilion," said WGCPARIS2015 Exhibition Director, Rodney Cox. "This delivered an outstanding outcome for this specialised sector and we will be building on that success in Paris".

One of the several companies that participated at LNG 17, RegO, a US alternative fuel product manufacturer, rated their LNG 17 experience so high they are eager to participate at the Natural Gas for Transportation Village this year. "LNG 17 for RegO was the best experience that we have ever had," wrote a company representative on an event feedback form.

In fact, the majority of LNG 17 participants surveyed rated value gained from the inclusion of the Pavilion at that event as high to moderate. The model offers tangible benefits for exhibitors and end users in an environment conducive to discussion and exchange.

What can we expect for natural gas fuel in 2015?

Resourcefulness and resilience are two prime characteristics of industry participants committed to natural gas as a cleaner, quieter, safe fuel for transportation. When a new fuel has the temerity to impose on mainstream fuel market space, the critics sharpen their pencils. Those criticisms are gradually being silenced: vehicle performance now compares favourably to gasoline and diesel, infrastructure challenges are being met with microbox technology and modulised gas transport, fuel storage and range issues are being addressed by lighter materials and conformable tanks, and the high cost of buying into natural gas for transportation technology continues to be offset by low prices at the pump.

There has been speculation about the impact of the downward plunge of the oil price on the natural gas fuel for transport market. The simple answer is, while the barrel price swings through its cycle of ups and downs, natural gas is quietly and confidently gaining ground, verified by an inspection of NGV Global news coverage. Since January there has been a stream of articles about: new contracts, new companies, new funding and new investment, new fleets, new technology, new CNG trains and new LNG-fuelled vessels and LNG bunker vessels. It is busy and it will get busier as the year unfolds.

▼ More LNG trucks, more LNG stations – European heavy-duty transportation is evolving.

▲ CNG- and LNG-fuelled trains are gaining traction, emulating diesel performance with lower emissions, less noise. This CNG-fuelled locomotive operates in the Czech Republic

The positive performance of the natural gas fuel market is also testimony to the growing realisation that using natural gas does make a difference to the health of the environment and to the inhabitants of urban space. It is not all about price and performance. Typically, natural gas vehicles emit substantially less particulate matter and reduce nitrogen oxides and ozone forming emissions drastically compared to diesel. On a well-to-wheel basis, natural gas as a fuel lowers CO_2 emissions notably and the CO_2 savings are huge when renewable biomethane is blended in (40% CO_2 savings at a 20% biomethane share). In addition, reduced noise levels compared to diesel engines make natural gas an ideal motor fuel for transport and refuse collection in the urban environment.

2015 will witness further transformation of major markets, with China, Russia, the USA and other countries approving policy to embrace CNG, LNG and biomethane. For example, the number of CNG filling stations in the USA has doubled since 2010, reaching 1,525 at the start of this year, with an additional 157 in planning. LNG stations have grown from 39 in 2010 to 103, with 82 in planning. More than 150,000 NGVs are on US roads. Five years ago, market analysts were asking "chicken or egg" questions; today, the market has its own momentum.

The Natural Gas for Transportation Village at WGCPARIS2015 is the place to learn more about the growing edge of this fuel market, and to learn how to harness the commercial and environmental power of natural and renewable gas.

David Perry is the Business Manager of NGV Global (www.ngvglobal.org) and Puya Sepahzad is the Press Officer of NGVA Europe (www.ngvaeurope.eu). For further information on WGCPARIS2015, including the Natural Gas for Transportation Village, contact Lorraine Elysée on lelysee@etf.com.au or visit www.wgc2015.org.

Fueling the Future

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Around the world, natural gas has tremendous potential for growth and the United States welcomes the opportunity to lead the International Gas Union and the global discussion around the benefits of this important energy resource. The USA triennium will enhance the International Gas Union's position as the global voice of gas to leverage these opportunities and support market expansion across the world.

We look forward to working with all International Gas Union members throughout our term and welcoming you to Washington, DC, our nation's capital, for the 2018 World Gas Conference.

David Carroll,

President and CEO, Gas Technology Institute
President, IGU 2015 - 2018

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Countdown to WGC 2015

Final preparations for the 26th World Gas Conference are underway and for this issue we have expanded the section dedicated to the Coordination Committee progress report with articles giving readers an idea of what to expect.

Welcome to the 26th World Gas Conference

By Daniel Paccoud

IGU's flagship event, the triennial World Gas Conference is a powerful platform to discuss the prevailing issues that affect our industry's prospects. The 26th edition, WGCPARIS2015 is the culmination of the French Presidency of IGU and will take place in the French capital's Porte de Versailles Convention Centre, June 1-5.

This is a pivotal year for our industry. Not only are we in the throes of some highly volatile conditions, but economic and environmental priorities among major economies are on a collision course unless we can develop a more comprehensive framework for balancing emissions control with affordability of supplies and long-term energy security.

WGCPARIS2015 represents an important opportunity to underline the role that natural gas can play both as an enabler of the transition towards a low-carbon economy and as a foundation fuel that can underpin our ability to meet the world's increasing energy needs, particularly in emerging and high-growth economies.

▸ Daniel Paccoud, NOC Chair.

▸▸ Annie Louys, NOC Secretary.

More than 100 countries will be represented at WGCPARIS2015, enabling a comprehensive discussion about the energy issues affecting developed and emerging nations around the world. The President of France, François Hollande will open the conference and thousands of international delegates are due to attend including policy makers and top executives from the major gas companies, as well as professionals working in all parts of the gas industry value chain. The 45,000m^2 exhibition space is integrated into the conference area and will showcase more than 350 exhibitors.

I am grateful to the French Gas Association (AFG), our host sponsors, Total and GDF Suez, as well as our full roster of sponsors, which includes the world's most prestigious oil and gas companies, for their commitment to delivering a compelling, far-reaching conference.

Key Facts

26th World Gas Conference (WGCPARIS2015)

Date:	June 1-5, 2015
Venue:	Porte de Versailles Convention Centre, Paris
Number of global delegates:	4,000+
Countries represented:	100+
Global gas organisations attending:	600+
Number of expert speakers:	500+
Conference sessions covering the whole gas value chain:	70+
Number of global exhibitors:	350+
Register as a delegate today www.wgc2015.org	

Exciting programme

Crucially, we are also delivering a dedicated youth programme, designed to inspire a new generation of energy industry leaders. Their contributions to the discussions will be particularly meaningful, as we lay the foundations for our industry's future role in global development activity. And, for the first time, the World Gas Conference will feature a dedicated pavilion in the exhibition which will highlight the role of gas in the transportation sector. Co-hosted by NGV Global and NGVA Europe, the Natural Gas for Transportation Village will provide an opportunity for developers to showcase the latest innovations in clean vehicle delivery and enhance understanding of the fuel's potential for personal, public and industrial transportation.

The conference programme (*see table over*) features more than 70 sessions covering all sections of the oil and gas value chain, presided over by some of the industry's most senior leaders. This comprehensive approach is essential to our goal of unlocking a consensus about the long-term role that gas can play in the future energy mix and setting out our industry's response to the challenges that lie ahead.

The programme encompasses four core pillars of future gas sector development. Each will have a day of the conference dedicated to addressing the issues within those themes, which combined are designed to support the overall theme of the French Triennium: "Growing together towards a friendly planet". The pillars are:

- Natural gas as a core pillar for a sustainable future of the planet;
- Gas, renewables and electricity: together a perfect combination;
- Natural gas as a growth factor for new economies;
- Human capital for the future of the gas industry.

Key business solutions to the ever changing marketing conditions will be suggested at the

A magnificent welcome gala evening of lights and glamour has been planned to take place at the Grand Palais des Champs-Élysées.

event which will discuss market dynamics, showcase new technology and offer analysis on the current market trends.

You will be able to enjoy a range of technical tours showcasing some of the region's world-class plants and LNG terminals such as the Céré-la-Ronde UGS facility, Fos Cavaou and Dunkerque LNG receiving terminals, Montereau power plant and Alfortville interconnection grid. Social tours to Burgundy, Mont Saint Michel and famous Paris sites have been designed to make your experience memorable.

Delegates can look forward to valuable networking and learning opportunities and we are confident that WGCPARIS2015 will be an outstanding event. Paris will certainly offer an exceptional experience of culture, the finest culinary cuisine and world famous sites which will make this an enriching and memorable trip.

I look forward to seeing you all in Paris.

Daniel Paccoud is Executive Director of WGCPARIS2015 and Chair of the National Organising Committee.

Overall Programme for WGCPARIS2015

Working Days June 2-5 (Welcome Gala Reception on June 1)

June 2 Natural gas as a core pillar for a sustainable future of the planet		**June 3** Gas, renewables and electricity: together a perfect combination		**June 4** Natural gas as factor for new a growth economies		**June 5** Human capital for the future of the gas industry	
8:30 to 10:00	Opening ceremony	**8:30 to 10:00**	7 Thematic sessions	**8:30 to 10:00**	7 Thematic sessions	**8:30 to 10:00**	7 Thematic sessions
10:15 to 11:35	Keynote addresses	**10:30 to 12:00**	Keynote addresses	**10:30 to 12:00**	Keynote addresses	**10:30 to 12:00**	2 Strategic panels and 1 Special session: Women's place Gas communication IGU awards
11:45 to 12:15	Exhibition opening					**10:30 to 13:45**	Interactive showcases
12:15 to 13:45	Luncheon address	**12:15 to 13:45**	Luncheon address	**12:15 to 13:45**	Luncheon address	**12:15 to 13:45**	Luncheon address
14:00 to 15:00	Keynote addresses	**14:00 to 15:00**	Keynote addresses	**14:00 to 15:00**	Keynote addresses	**14:00 to 15:30**	Presentation of 2015-2018 Triennial Work Programme
15:15 to 16:45	4 Strategic panels: Political leaders Prospective 2050 Gas flaring reduction LCA a tool for decisions	**15:15 to 16:45**	4 Strategic panels: Gas advocacy LNG a key factor NGVs Smart grids	**15:15 to 16:45**	4 Strategic panels: Gas development in emerging countries R&D & innovation Unconventional gas Human capital	**15:45 to 16:45**	Closing Youth Event
17:00 to 18:30	7 Thematic sessions	**17:00 to 18:30**	7 Thematic sessions	**17:00 to 18:30**	7 Thematic sessions	**17:15 to 18:30**	Closing ceremony
From 13:00	Interactive showcases	**10:30 to 16:30**	Interactive showcases	**10:30 to 16:30**	Interactive showcases	**18:45**	Farewell party

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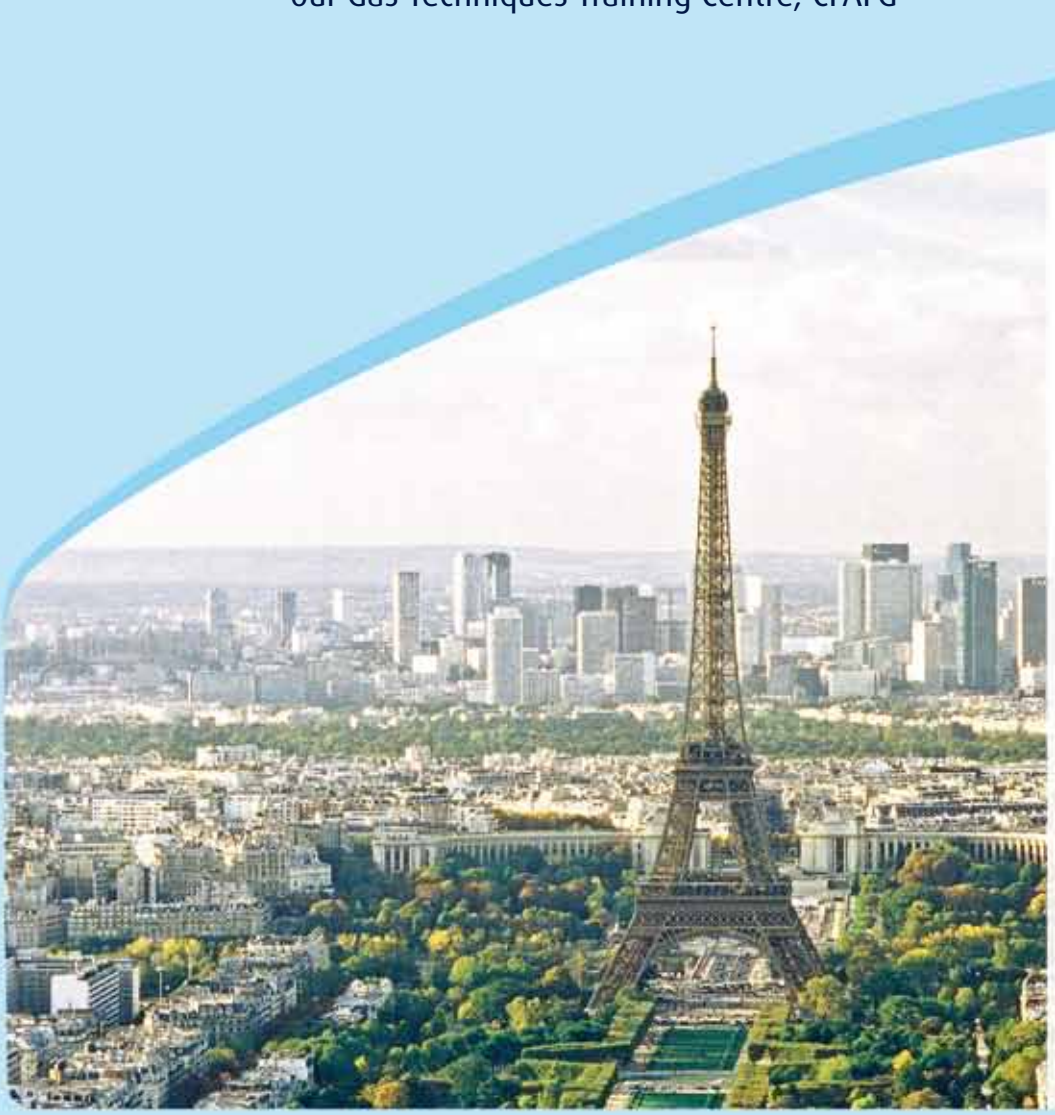

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Record Number of Abstracts for WGC Technical Programme

By Georges Liens and Yves Tournié

▲ Georges Liens.

▲ Yves Tournié.

We are now making final preparations for WGCPARIS2015, where the results of the 2012-2015 Triennial Work Programme carried out under the French Presidency will be presented. This will be the culmination of three years of studies and research conducted by 1,030 industry professionals – a record number of participants in IGU's technical committees and task forces.

The programme (see the outline on page 90) has been structured so that each working day of the conference is dedicated to one of the four transversal themes or "pillars" which support the overall theme of the triennium: "Growing together towards a friendly planet". These are:

- Natural gas as a core pillar for a sustainable future of the planet (green pillar);
- Gas, renewables and electricity: together a perfect combination (yellow pillar);
- Natural gas as a growth factor for new economies (red pillar);
- Human capital for the future of the gas industry (blue pillar).

Some 42 thematic sessions during the conference will cover the work of the technical committees and task forces, while there will be 14 strategic panels and two special sessions including one for presentation of the IGU Global Gas Award and Best Practices Award. Each morning and afternoon session will feature keynote speeches by major industry figures. In addition there will be four luncheon addresses.

The response to the call for abstracts was outstanding with 1,520 received from 65 countries. This was 810 more than for WGC 2012 which itself set a record. Some 80% of the authors submitting abstracts also applied for one of IGU's awards. There were 571 applications for the Global Gas Award and 650 for the Best Practices Award. *Table 1* breaks down the number of abstracts received by committee and task force, *Table 3* shows the top 10 submitting countries and *Table 4* the main submitting companies and organisations.

After careful evaluation the committees and task forces have selected 398 abstracts for presentation (*see Table 2*). Some 45 countries are represented in this selection.

Interacting with delegates

All the strategic panels and special sessions, the main thematic sessions (22 out of 42) and four of the Youth Event sessions will feature Wisembly, which is a mobile and web service for facilitating conferences. Six rooms will be equipped with Wisembly and there will be a total of 42 interactive sessions.

Without interrupting the speaker, anonymously or not, audience members can share their questions and reactions via their mobile phone, laptop or tablet. A moderator located with the Wisembly assistant at a desk near the stage selects the "best" questions and then transmits them to the session's leader. The selected questions are displayed on a screen. Speakers answer them during the Q&A session. Wisembly also allows live voting sessions with the question appearing on participants' devices for them to vote on and the result appearing on the main screen.

Wisembly was introduced to participants in the IGU meetings in Berlin in October 2014 during a workshop (see pages 100-104 for a report on this).

Abstracts Received by Committee and Task Force

Committee/ Task Force	*Total Submissions Received*	*Oral Presentation*	*Interactive Showcase*
WOC 1	336	236	100
WOC 2	68	32	36
WOC 3	214	142	72
WOC 4	93	57	36
WOC 5	162	109	53
PGC A	114	79	35
PGC B	165	124	41
PGC C	32	19	13
PGC D	139	84	55
PGC E	88	58	30
PGC F	65	42	23
TF 1	33	26	7
TF 2	11	5	6
TF 3	N/A	N/A	N/A
Total	**1520**	**1013**	**507**

Table 1.

Abstracts – Final Selection

Committee/ Task Force	*Accepted*	*Oral Presentation*	*Interactive Showcase*
WOC 1	47	23	24
WOC 2	30	12	18
WOC 3	35	18	17
WOC 4	33	18	15
WOC 5	52	27	25
PGC A	38	20	18
PGC B	35	16	19
PGC C	20	10	10
PGC D	46	21	25
PGC E	22	11	11
PGC F	21	9	12
TF 1	10	6	4
TF 2	9	4	5
Total	**398**	**195**	**203**

Table 2.

Abstracts – Top 10 Submitting Countries

	Country
1	Iran
2	USA
3	France
4	UK
5	Russia
6	China
7	Brazil
8	Algeria
9	Turkey
10	The Netherlands

Table 3.

Abstracts – Main Submitting Companies/Organisations

Bureau Veritas	Osaka Gas
DNV GL	PDVSA
Gas Technology Institute	Petrobras
Gazprom	Petroleum University of Technology
GDF Suez	Qatargas
Hormozgan University & Borzouyeh Petrochemical Company	Shell
İGDAŞ	Sonatrach
KOGAS	South Pars Gas Complex
National Iranian Gas Company	Total

Table 4.

▲ Many sessions will enhance interactivity by using the Wisembly service.

Interactive showcases

Instead of the traditional posters WGCPARIS2015 will feature interactive showcase sessions. There will be two special areas operating in parallel, each with a capacity for around 20 people to listen to a live presentation and a separate bank of touch screens.

During the conference there will be a total of 41 sessions of 45 minutes. They will be held after 13:00 on June 2, between 10:30 and 16:15 on June 3-4 and between 10:30 and 13:45 on June 5. Each interactive session will be dedicated to one of the topics being addressed in the thematic sessions.

The interactive showcase areas will feature 18 large (42 inch) interactive touch screens. Using these screens visitors to the area will be able to search through all of the presentations being presented throughout the duration of the conference. Visitors will be able to search the presentations by topic or by author or keyword.

▼ An artist's impression of one of the two interactive showcase areas.

Youth Event

Around 200 talented students and young professionals from all over the world will have the opportunity to participate in the WGCPARIS2015 Youth Event, which will revolve around two topics: sustainable energy for all and how the industry can attract and retain young people, especially women.

The Youth Event will start with an opening ceremony and team building evening on Tuesday, June 2 and end with a plenary closing ceremony and farewell party on Friday, June 5. There will be dedicated conference sessions, workshops, active participation in several conferences of the main event and opportunities for networking. For more information see the following article by Marc Mopty, the Project Manager of the Youth Event.

For final updates on the main programme and the Youth Event please visit www.wgc2015.org. We look forward to welcoming you to Paris.

Georges Liens is the Chair and Yves Tournié is the Secretary of the Coordination Committee.

Pierre Breber
President, Gas and Midstream
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Stimulating Programme for WGC Youth Event

By Marc Mopty

The growth of the global natural gas industry in recent years has increased the need for skilled staff and fresh talents. However, the industry is viewed by the new generation of professionals as less attractive than other sectors and less environmentally friendly, resulting in a general lack of interest in gas industry careers.

The WGCPARIS2015 Youth Event will show that, on the contrary, the gas industry has many great opportunities and exciting challenges for the youth of today. It will also give the floor to young people and invite them to exchange opinions with gas industry leaders from around the world.

This initiative is led by IGU's Task Force 1 – Human Resources. It is one of the actions we are promoting to tackle the shortage of young talent in the industry. The Youth Event during WGC 2012 in Kuala Lumpur was a great success; now the expectations are high for this second edition.

The programme will revolve around two main topics which are key issues for the industry and also important for young people:

- Energy for all: the role of gas in sustainable development;
- Attracting and retaining young talent, especially women: a key challenge for the gas industry.

The aim is to gather about 200 talented students and young professionals aged between 20 and 35 from all over the world for a three-day programme. We are expecting people from a wide range of backgrounds (including engineering, R&D, finance, human resources, marketing and sales) to enhance the level of interaction.

The WGC 2012 Youth Event was a great success.

The event will be fully integrated with WGC PARIS2015 thanks to a dedicated area of 600m^2 in the middle of the conference pavilion and a programme coordinated with the main event programme. The Youth Area is designed specifically for the event with a large space for the conferences and workshops, but also with casual places to network, relax, have a snack or learn more about the industry and French culture.

The programme is designed by young people for young people. We are a team of 10 young professionals who are working hard to build up an event that should be unforgettable for all the participants.

The programme

To achieve our goal of having young people deliver a message to the gas industry, we have designed a step-by-step programme.

The event will start with an opening ceremony and an ice-breaking evening in Paris on Tuesday, June 2. This will enable participants to familiarise themselves with the programme and get to know each other. On Wednesday, June 3 they will attend several presentations by high-level speakers on our two main topics. As we want as much interaction as possible with the industry leaders, we will use the interactive Wisembly system. Using their smartphones or tablets, participants will be able to ask questions, vote on some questions and respond to surveys.

Then there will be four workshops, two for each topic:

- Response of young people to the energy transition;
- Local access to sustainable energy;
- Marketing of the industry;
- Imagine the industry of tomorrow.

For each workshop there will be between five and eight competing groups. Participants will be informed of their workshop about one month before the event to allow them to start advance preparation. Once at the event they will have access to more information by attending best practices sessions connected to their workshop.

▲ The Youth Event organising team are (*from left to right*): Marc Mopty (GRTGaz), Chloë Bruyère (Total), Nina Vaitti (Total), Beatriz Guillen-Francos (Total), David Nedelec (Total) and Eirini G. Ore (GDF Suez). *Not shown are:* Raoudha Jribi (ETAP), Frédéric Haas (GDF Suez), Julien Perez (Total) and Marie-Claire d'Hautefeuille (GDF Suez).

The best practices sessions will bring together 50 people for one hour. Leaders of a flagship project, a network or an association which has built up a successful operation linked with our subjects will present their approach. Participants will be able to ask as many questions as they want.

Participants will then have about seven hours to develop their point of view and their presentation. Different types of deliverables are expected so that they can practise their creativity. Being ready to present their opinion in front of a jury on Thursday, June 4 will be a thrilling challenge.

The last part of the workshops consists of participating in some of the main conference sessions dealing with our two Youth Event topics. Thus, young people will have the opportunity to show that they have some solutions and a vision, and remind the older delegates that they are the future of the industry.

On Friday, June 5 participants will have the opportunity to discover some success stories. The format of these sessions will be the same as those for the best practices. The aim is to attract and retain young people showing, through the testimonies of the speakers, all the exciting opportunities that the gas industry can offer. There will be a large variety of speakers from all parts of the gas chain (e.g. upstream to downstream, working in engineering, R&D, finance and human resources).

The Youth Event Programme

Finally, there will be a plenary closing ceremony. After a short summary of the three-day programme, the winning team of each workshop will present their work in front of 600 delegates. The audience will be able to vote for the overall winning team who will receive a trophy and prize from high-level leaders.

Youth Event participants will then be invited to the join the main WGCPARIS2015 farewell party on Friday evening under the theme "Franco-America" to mark the handover from the French to the US Presidency of IGU.

Registration is open

Registration for the Youth Event is now open via the website for a fee of only €600 (VAT excl.) compared to the €2,250 minimum for the main event. The fee will include optional accommodation and a free pass for public transportation. For more information about this package, please visit our website. We have succeeded in having a low fee thanks to numerous sponsors and partners who want to demonstrate their interest in the new generation.

Marc Mopty of GRTgaz is the Project Manager of the WGCPARIS2015 Youth Event.

For more information:

Website:
www.wgc2015.org/youth-event

Twitter:
twitter.com/WGC15YE

Facebook:
www.facebook.com/groups/1516712205243594/

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Public Acceptance Workshop Trials New Technology

By Georgia Lewis

During the IGU meetings in Berlin in October 2014, Programme Committee E – Marketing and Communication held a workshop on public acceptance of gas projects. The session was also used to trial a Wisembly service, which will be used during interactive presentations at WGCPARIS2015. Wisembly allows workshop participants to interact using mobile phones, tablets and laptops that are connected to the internet.

Entitled "Golden Age of Gas? Not in My Backyard!", the workshop was organised by Hansch van der Velden, Corporate Communications Director, Gasunie, who is the leader of Study Group E.3, and Dimitri Schildmeijer, Senior Communications Skills Trainer and Partner, WPNT Europe. Mr Schildmeijer started proceedings by sharing the basic premise that "without public support, there is no business case" for gas projects.

Mr van der Velden said that "respectful relationships" with citizens are a good starting point for engaging effectively with the public. He says that public unwillingness in relation to accepting gas projects in their areas is a major hindrance for operators. The example of local opposition to a Shell carbon capture and storage project in Barendrecht, The Netherlands, was cited. The force of public opposition led to the project being cancelled by the Dutch government in 2010.

A picture of an angel was flashed on a screen and on the devices of participants to illustrate the image of gas within the industry. Mr van der Velden contrasted this with a photograph that represented the more demonic image of gas held by many of the wider public. He cited a Goldman Sachs study of 190 oil and gas projects which found that "stakeholder risk" – that is, non-technical opposition –

▼ The gas industry needs to engage effectively with the public – a town hall meeting in Sydney on coal-seam gas development.

caused delays in 73% of the projects. In comparison, only 21% of the 190 projects studied were delayed because of technical risk.

A quote from Shell Australia's CEO, Andrew Smith, was presented to the workshop to summarise the twin challenges of dealing with activism in the online world and leading effectively in the face of digital activism: "Activism boosted by digital communication is fast becoming one of the greatest challenges facing Australian growth. Effective leadership is about building coalitions of support and casting egos aside."

Building trust and "co-creating value" is a means of achieving a "win-win" situation for the company and the community, and this requires the cooperation of staff and management as well as the general public, according to Mr van der Velden.

"Our hardware must come with soft skills," he said and online engagement is an essential part of this process.

Barbara Jinks, Executive Director of LNG 18 and Vice Chair of PGC E, and Feikje Wittermans, Business Development Manager for Vopak, then led a panel discussion with examples from their own experiences with public acceptance of gas projects and the obstacles faced by operators.

Ms Jinks said the news of the US shale gas revolution sparked alarm in Australia in relation to coal-bed methane (known as coal seam gas in Australia) with many people complaining to their gas suppliers that they were unaware they had been using gas sourced from coal seams for several years. Ms Jinks said that in Australia strong opposition to coal seam gas comes from cities, "nowhere near the coal seam gas" but residents in rural areas near the wells are generally more supportive because they can see the environment is being protected and the gas industry benefits regional business and jobs.

Ms Wittermans cited the example of the LNG terminal in Rotterdam, where there was much confusion after members of the public mistook LNG for LPG and were worried about explosions. A communications strategy was devised to educate the public on LNG and to engage people with a technical or scientific background in the neighbouring towns, who could educate and provide comfort to the public. "A key lesson of effective public engagement is to involve local experts who can help on education and acceptance," said Ms Wittermans.

▼ Gate LNG in Rotterdam has a comprehensive communications strategy.

The workshop was used as a test session for Wisembly, an online interface that allows live questions to be asked and posted on a screen, documents to be downloaded, and on-the-spot surveys to be taken during presentations. During the panel discussion, the question was asked: "How many engineers are there among the deputies and ministers?" The general consensus was that there are "not enough" engineers in decision-making positions in relation to gas projects but it is up to the gas industry to educate representatives at all levels of government.

Ms Jinks again gave the example of coal seam gas and how, in Australia, the risk of water pollution is considered a serious issue. She said it is a combination of "fear of the unknown" and "disruptive technology" that leads to people being unable to keep up with or trust the latest developments.

At a local government level, Ms Wittermans said that often "people are not chosen for their technical competencies" and this can result in a widespread lack of understanding. "They are politicians, not engineers," said Ms Wittermans.

"When it's a new technology, people need to hear from trusted experts," said Ms Jinks.

Mr van der Velden said that fracking in particular creates a lack of understanding among the public but it is important to "take anxieties seriously". A Wisembly on-the-spot poll of workshop participants showed that 72% of those present believed that there is a debate taking place on shale gas in their country. The Wisembly interface was then used to create a word cloud on the main terms the participants associated with the importance of public acceptance, with "communication" coming out as the most popular.

There was a lively discussion about whether gas industry leaders would be happy with a shale gas project within a few miles of their homes. Ms Jinks said that as she supports the gas industry she would be happy with such a project if the gas company negotiated in good faith, was flexible and that there was fair compensation.

The rise of social media was also discussed in terms of how it has changed the way the gas industry engages with local communities. Ms Jinks said the "Our natural advantage" online campaign in Australia had played a significant role in educating the public on gas projects. This campaign is run via the website www.ournaturaladvantage.com.au, an advertising and education campaign to promote the benefits of natural gas in Australia.

Another word cloud was created with participants naming the words they most strongly associate with the role social media plays in public acceptance. The most popular words were mostly positive – such as "information", "transparency", "fact-based", "accessible" and "immediate" although "alienates" was also mentioned. But overall, it was generally agreed by the group that social media, such as Twitter, should be used as a constructive means of public engagement and its immediacy makes it useful for fast feedback.

Public acceptance of wind power versus gas projects was discussed as an example of where gas operators could better engage with the community. Some participants felt that the public acceptance of gas projects varied from place to place, and in other areas wind power was not accepted largely because of the visual impact of turbines on the landscape. However, the renewable nature of wind power and its clean, green image can make it an easier sell to the public than gas and this is an obstacle many gas operators will have to overcome when engaging with the public.

The workshop concluded with information given about Wisembly and Poken, which will be used at WGCPARIS2015. Delegates will be given interactive device support at the event.

Georgia Lewis is the Managing Editor of International Systems and Communications.

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Wisembly and Poken at WGCPARIS2015

Two new forms of information exchange technology, Wisembly and Poken, will be in use at WGCPARIS2015. Wisembly, an interface for workshops, presentations and meetings, was trialled at the PGC E workshop.

Participants will need to bring either a laptop, mobile phone or tablet to workshops, presentations and meetings in order to use Wisembly. The session starts with everyone logging on to the Wisembly page which has been set up for the particular event. An online interface will appear on everyone's devices as well as being projected onto a large screen on the wall for those who are not logged on to Wisembly.

Via Wisembly, participants can help set the tone of the discussion and debate by typing in questions which will then appear on the wall screen and devices for the whole group to see.

Wisembly can also be used to conduct snap polls throughout sessions. Moderators are able to set up simple survey questions in advance and these can then be broadcast via the Wisembly page during a session. Participants can vote and the results are announced within moments.

Creating word clouds as an additional catalyst for debate and discussion can be done via Wisembly. Similar to the snap polls, participants can enter words or phrases that they associate with certain topics via the interface and a word cloud, in which the most popular words or phrases appear on screen bigger than the less popular words, can be quickly created.

It is worth noting with the word cloud function that when participants enter phrases rather than single words, these need to be put in inverted commas (e.g. "sustainable development") so they are not separated in the word cloud presentation.

Wisembly is also a powerful tool for storing documents relevant to presentations so that participants can download them for future reference. This is an effective way to disseminate information and to save paper by not printing excessive copies of documents.

Poken technology will also be used to facilitate communication and save paper. Prior to, or during, the conference, delegates will be able to register online for a Poken account. At the conference, delegates will be able to pick up their Poken device. This will allow business cards to be exchanged electronically – all delegates have to do is touch their Poken devices to swap contact details, rather like a digital handshake.

At WGCPARIS2015, there will be 42 touch points at the venue. Delegates will be able to tap their Poken devices at these touch points to obtain documents. There will be approximately 250 documents in relation to six different projects and once they have been accessed via Poken, delegates can download documents via their online Poken accounts. Delegates can also sign up for an online Poken account after the event.

Using Poken, business cards can be exchanged electronically.

Russian Gas Society

Pavel Zavalnyy
President
of the Russian Gas Society

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Third Party Access to Gas Distribution Networks

By José Carlos B. Oliver, Diego C. Castilho and Nicholas Biederman

Study Group 4.1 of Working Committee 4 – Distribution has been looking at third party access (TPA) to gas distribution networks. This article presents some key elements from the report SG 4.1 will present during WGC 2015.

Since its beginning the natural gas industry has been highly regulated. In some places, especially in developed markets, this highly regulated model has led to inefficiency and an imbalance between production of and demand for natural gas.

A staged liberalisation process began in the 1970s leading to the important step of implementing open access and unbundled regimes. In these regimes natural gas supply is divided into two segments: 1) the regulated natural gas infrastructure, such as transmission and distribution networks, and 2) the unregulated natural gas supply in which natural gas is treated as a commodity.

▼ In open access and unbundled regimes natural gas infrastructure is regulated while gas supply is unregulated.

The liberalisation process began in the USA, followed by European countries, where the UK was a pioneer in terms of implementation of TPA and had a special role in the development of the legal regime adopted. Many other European countries also engaged in this process. Some other regions and countries took initiatives to implement TPA, but up to now the effects of the new regulatory rules in those places seem to be limited.

TPA may be described as a regulatory framework where customers are able to use a natural gas system to transport gas for their own use or for resale from a source of gas of their choice, through non-discriminatory conditions and tariffs.

TPA presents a wide variety of concepts and stages of development worldwide. The level of implementation seems to be directly related to the maturity of the gas industry in the studied area, and the mature markets of the USA and EU are considered as references for TPA regulatory frameworks.

It is also important to note that increasing security of supply and reducing the final cost to consumers are the pillars used to justify and support the implementation of TPA.

The US model

The US natural gas market has three main characteristics: 1) it is very mature, 2) has a well-developed pipeline network and 3) net imports are low.

The liberalisation process started during the gas supply crisis of the 1970s with the gradual

removal of wellhead price ceilings. TPA was first introduced in 1985 with the implementation of a voluntary unbundling regime to separate the natural gas transportation service from supply. In 1992, unbundling became mandatory and TPA regulations were under continuous fine tuning until 2008.

The liberalisation process was gradually implemented in order to allow the market to have sufficient time to restructure itself. However, during the transition period there were several litigation proceedings between the transportation companies and the gas suppliers regarding take-or-pay contracts. The model required all transportation services, such as transmission, underground storage and LNG facilities to be unbundled. Distribution service was also unbundled in the states that adopted retail unbundling. The state regulatory agencies have jurisdiction and autonomy to define if TPA is also applicable to distribution services and which customer segments are eligible.

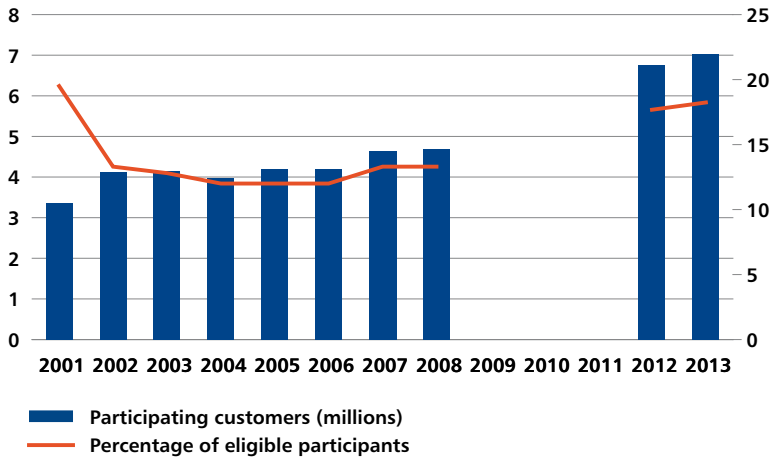
In vertically-integrated companies the infrastructure functions are required to be separated from non-regulated functions in independent legal organisations (legal unbundling). Account unbundling was introduced in order to avoid cross-subsidies between production and service companies after liberalisation. Standards of conduct requirements (functional unbundling) to keep the infrastructure activities separate from the supply activities and avoid anti-competitive practices were also put in place. In addition to the unbundling requirements, some other requirements based on transparency and non-discrimination principles were implemented to help gas purchasers access gas infrastructure with the same rights and services, independently of the origin of the gas.

In states that have adopted TPA, residential, commercial and small industrial customers can purchase gas from companies other than their local distribution company (LDC). This gas, however, is still delivered through the mains and services maintained by their LDC. Emergency response, customer service and meter readings are also still performed by the LDC.

▲ In the US states that have adopted TPA, the LDC is still responsible for delivery, meter readings, customer service and emergency response.

Large industrial customers also have the opportunity to bypass their local distributors by establishing direct contracts with interstate transmission companies and producers.

Eligible and Participating Customers in Residential Choice Consumer Programmes



Source: US Energy Information Administration, Natural Gas Annual.

Note: Data was not collected 2009-11.

▲ The number of natural gas customers participating in customer choice programmes in the USA is increasing.

▲ EU member states can opt for either the Ownership Unbundling System (OUS) or have an Independent System Operator (ISO) as in Italy – the Snam Rete Gas dispatching centre in Milan.

TPA has been in effect in the USA for more than two decades and the market has stabilised under the new regime. While there were price adjustments and costs did rise in some parts of the country, concerns about supply interruption turned out to be unfounded. The present regulations added dynamism, increased competition in the market and decreased the market power of the transmission companies. Although it is not clear if the implementation of TPA was successful in reducing the final cost to consumers, it was successful in ensuring reasonable prices as the gas cost is defined by the balance of market forces. Security of supply was increased as the market defines the level of investment required to balance demand and production.

The EU model

Like the US natural gas market, the EU market is very mature and well developed. The major difference between them is that the EU's conventional reserves are almost depleted and, therefore, security of supply is the major concern of the gas industry. EU members consider that the development of an efficient internal market is the best way to face the challenges and uncertainties of the future; as a reliable and interconnected system can increase the security of supply.

The EU market began to be opened up in 1998 with the implementation of negotiated TPA for transportation, distribution, storage and LNG facilities. Open access became mandatory as of July 2004 when industrial consumers were able to choose their gas suppliers. The same opportunity was given to residential consumers in July 2007. Current unbundling requirements in the EU are very rigid. Members must adopt either the Ownership Unbundling System (OUS) or the implementation of an Independent System Operator (ISO). In the OUS the companies involved in gas supply cannot have infrastructure assets. In the ISO the vertically integrated companies can keep ownership of their infrastructure assets, however, the asset must be operated by an independent operator. Current regulations also guarantee the non-discriminatory access of alternative gases, such as biogas provided that it meets or exceeds quality and safety requirements.

Initial results are promising in terms of competition, integration and supply security. These

results are based on diversification of supply sources and transport routes, balance between supply and demand according to market forces and introduction of alternative gases to the grid. It is not clear, however, if current regulation will be able to produce the desired reduction in the final price for consumers; especially in the case of small consumers.

TPA in other regions

Many other countries apart from the USA and those in the EU have demonstrated an interest in implementing TPA. Up to now, none of them have been able to achieve this objective effectively for different reasons. Among those reasons are:

- TPA is not mandatory for all gas infrastructure: LNG terminals and storage facilities are vital for some natural gas systems;
- A single company is responsible for almost all gas supply;
- The system is not interconnected;
- The gas market is still being developed.

Conclusion

The US and EU adopted different approaches to TPA regulations, but both were successful in implementing an effective TPA model. The reason for this success relies on the regulatory framework adopted and on market conditions. Being two of the major and most mature markets in the world, the conditions for the implementation of TPA were favourable because of the number of supply sources, highly interconnected systems and saturated market territories.

TPA rules adopted in other countries may be considered less rigid and, thus, similar to those adopted in the early stages in the US and EU. While these lenient rules were also not effective in the mature markets, they were the means for a transition to mandatory TPA.

Further, it should be considered that the non-effectiveness of TPA in other countries may not only be due to the lenient rules adopted, but also to some underlying market conditions. Therefore, in addition to more rigid rules, it is necessary to give incentives time to grow and develop the market in order to create an effective TPA model.

Another aspect that should be further evaluated is if the implementation of TPA in the retail market is advantageous; especially in the case of residential customers. Distribution companies may increase distribution costs because of the additional requirements of a TPA regulatory framework. The increase in those costs may not overcome the price reduction in the gas supply due to the low volume consumed by small customers. Although there are no recent detailed studies, the US and EU experiences tend to show mixed results for reducing the final price to small customers, reinforcing the need for further evaluation of this aspect.

José Carlos B. Oliver, Operations Director at Comgás, is the leader of Study Group 4.1 in Working Committee 4 – Distribution. Diego C. Castilho, Asset Integrity Engineer at Comgás, and Nicholas Biederman, Principal Consultant at NPB Associates and a member of the Gas Operations Innovation Alliance (GOIA), are members of SG 4.1.

▼ The US and EU experiences of TPA tend to show mixed results for reducing the final gas price to small customers.

Energy Independence with Natural Gas

The government of President Joko Widodo has set the Indonesian economic growth projection to 7% over the next five years. Since the economic crisis of 1998, we have never again reached such target. However, the President's belief is not impossible to achieve. As a nation with the fourth largest population in the world and supported by outstanding natural resources, Indonesia has more than sufficient capital to achieve a high economic growth.

The government's decision to increase the prices of subsidized fuel and to improve the funding allocation for infrastructures is an appropriate step to strengthen the fundamental base for Indonesian economy.

As the accelerator of economic growth, the allocation for infrastructure on our State Budget is still very limited over the last 2 years. In 2013, the budget was IDR 184.3 trillion and IDR 206.6 trillion in 2014. Through the improvement in infrastructure budget allocation made by the government, the private sectors and the investors will surely be more attracted to engage in the development of our country's infrastructures.

Here in PGN, we share the same commitment to be pro-actively involved in the infrastructures' development, particularly in the domestic utilization of natural gas. With our specialization in the transmission and distribution of natural gas, Perusahaan Gas Negara is committed to connecting Indonesia's supplies with clients across the country. Today we are evolving into a world-class integrated energy solution provider that will maximize the utilization of natural gas to meet challenging demands of modern industry and society.

Currently PGN continues to strengthen various customer segments, from the power plants, industrial fields, transportations, small and medium-sized enterprises, to households.

Our investment is directed to maximize the utilization of natural gas and to consolidate the energy independence by converting liquid fuel to natural gas. As a very large source of energy in Indonesia, natural gas holds a huge potential to reinforce the national economy.

Based on our experience in PGN, any gases that we channel to our customers yearly will save more than 60 trillion IDR, compared to the use of liquid fuel. That is surely a very large number of competitive advantages to drive the economy, encourage business expansions and create new job opportunities.

We all expect that the infrastructure development and the provision of non-liquid fuel energies such as natural gas will continue to increase. With a better infrastructure and a more affordable energy, we are going to have a much more dynamic economy and a stronger competitiveness. We will be better prepared to face the free market in the year to come.

PT Perusahaan Gas Negara (Persero) Tbk

Contact Center
500•645
www.pgn.co.id

Strong Commitment to Deliver a **Good Energy Solution**

We are committed to ensuring that Indonesia could continue to benefit from natural gas that is not only efficient, but also environmentally friendly. Therefore, PGN continues to encourage the amplification of the natural gas industry chain as sustainable Good Energy Solution

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Making the Case for Power-to-Gas

By Koen G. Wiersma and Aksel Hauge Pedersen

In the last issue Working Committee 2 – Storage looked at ways of storing surplus electricity generated from intermittent renewable energy sources including power-to-gas (P2G). Here Working Committee 5 – Utilisation focuses on the economic and technological case for P2G.

Governments around the world are setting ambitious targets for the share of renewables in the energy mix but today's main renewable energy sources – wind and solar – are intermittent. When favourable weather conditions mean surplus electricity is generated the surplus can be used to produce hydrogen (and oxygen) via water electrolysis.

Currently, two technologies are available in the commercial market: the alkaline electrolyser and the proton exchange membrane (PEM) electrolyser. The high temperature solid oxide electrolyser (SOEC) is a promising technology that is under development but it is not expected to be ready for commercial use for five to 10 years. The alkaline and PEM electrolysers have a relatively long start-up time from cold condition, but from standby position the ramp-up time to maximum capacity is a matter of seconds. The PEM electrolyser is claimed to have an even faster response time and load variation capabilities. For these technologies, research and development will result in improved technical performance and cost reduction.

All three technologies seem suitable for balancing support to the electricity grid, but the future in this market will be tough. Electric boilers, heat pumps, electric vehicles, electric heating, smart grids and other kinds of storage possibilities will offer the same kind of services. In terms of overall efficiency (electricity to hydrogen and back to electricity which is known as round-trip efficiency), power-to-gas is currently less than half as efficient as most other competing storage technologies. However, it is the only storage technology with a large capacity for longer periods.

Cost perspective – hydrogen production from electrolysers

With the present knowledge of hydrogen production from electrolysers, production cost calculations made by Working Committee 5's Topic Team 1 based on a 10MW electrolyser plant with 4,000 running hours, using different power prices (7.5, 5, 3.5 and 0 euro cent/kWh), show the indicative results illustrated in *Figure 1*.

The three cases for the period 2015-2030 indicate an expected development for electrolyser technology starting with the present mature alkaline electrolyser moving ahead of the PEM electrolyser, ending up with the very efficient SOEC respectively for 2015, 2020 and 2030. It is clear that the power price is an essential expense for hydrogen production and that its influence will grow as the capital cost will be reduced in the course of time.

Hydrogen as an energy carrier

Hydrogen has a number of uses as an energy carrier. It can be injected into the gas grid although the amount of hydrogen that can be added to natural gas is limited. Currently, a maximum of 2% hydrogen or lower is recommended in most countries in order to maintain safe operation of gas turbines, CNG tanks, feedstock customers and gas storages[1]. How-

1 *Admissible Hydrogen Concentrations in Natural Gas Systems*, Klaus Altfeld and Dave Pinchbeck; GERG 2013.

ever, research shows that many appliances might accept a much higher concentration of hydrogen.

There is also the P2G option of methanation, which consists of producing synthetic methane from hydrogen and carbon dioxide. The process is based on the Sabatier reaction, named after the discoverer of the process, Paul Sabatier. The methanation process can be executed either chemically or biologically.

Chemical methanation is a mature technology that is currently commercially available. It has been widely applied in different industrial applications. In this process, the reaction takes place by use of a catalyst. Biological methanation is an alternative to chemical methanation. The main difference lies in the temperature ranges used for the reaction and the response time. The biological methanation process is still in the research and demonstration phases. From a cost perspective, it seems that the biological process – if developed according to the plans – has the potential to be the most economic way to produce synthetic methane in the future.

Figure 2 shows the results for a methanation unit receiving hydrogen from a 10MW electrolyser. To keep it simple, the calculations do not include any tax costs and expenses for CO_2 emissions. Based on this, we calculate lowest possible methane costs post-2030 (SOEC) in the range of 2.3-11.7 euro cent/kWh.

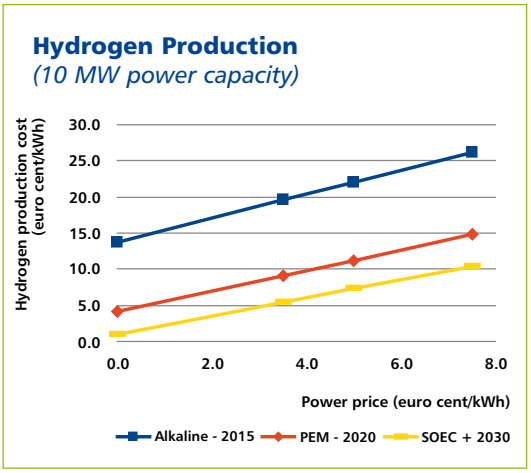
Summary and conclusion

The concept of power-to-gas is still at an early stage of development. There are a lot of questions to be answered, but the concept is very promising. P2G will provide flexibility to the electricity system using the existing gas infrastructure. P2G distinguishes itself from other energy storage options because, in addition to energy storage, it offers other benefits such as cost-effective transmission through the existing gas infrastructure, avoidance of expensive expansion of the electricity infrastructure and contribution to the green transformation of the energy sectors with renewable gas (hydrogen and/or methane).

P2G is not considered a cost-effective option in the short to medium term. Yet it is not unthinkable that a positive business case is possible in specific situations with favourable (local) conditions. It is also very unlikely that the step to a hydrogen-based economy will take place from one day to the next. Such a fundamental change will most certainly take several years, or even decades. Most of the limitations connected to hydrogen injection into the natural gas grid will disappear if hydrogen is converted to methane. The development of new efficient and low-cost technologies is important for the success of P2G. Biological methanation and the direct conversion of CO_2 and H_2 in the SOEC process seem to be the most challenging aspects.

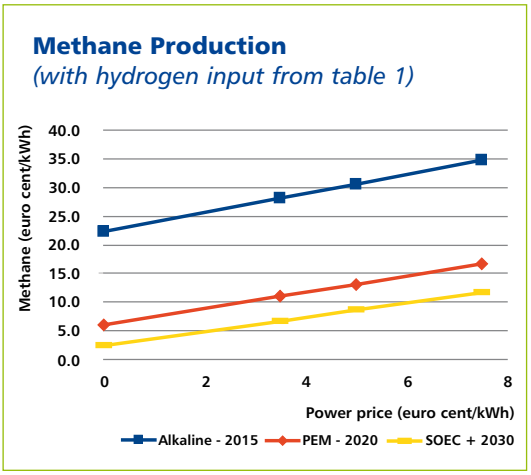
If you want to learn more and discuss this topic, please attend the WOC 5.4 Thematic Session during WGC 2015: *"Technological and economic aspects for power to gas and upgrading of biogas to natural gas quality"* on June 2, 17:00-18:30.

Koen G. Wiersma of NV Nederlandse Gasunie and Aksel Hauge Pedersen of Dong Energy are members of Working Committee 5 – Utilisation.



▲ Figure 1. Hydrogen production cost via electrolysis for the coming 10-20 years.

▼ Figure 2. Summarising results for production of methane for a 10 MW (electrolyser) unit.



Winning New Gas Customers

By Alfredo Ingelmo Torres

Traditionally gas distribution companies were operations-led. In today's competitive business environment they have to be marketing-led to win new customers. Programme Committee E – Marketing chaired by Spain has been looking at how gas can be promoted effectively.

Many energy consumers do not consider natural gas as an option because they are unaware of its benefits or have misconceptions about it. These may be linked to the price of competing energies, a negative image perception, or because there are a number of barriers to its consumption, forcing users to opt for other energy sources that are easier to obtain, even though they may be less beneficial. Competing energies are not standing still and the gas industry has a long way to go in conveying to customers the real benefits of gas in a simple and direct way.

Our experience of promoting gas in Spain shows that, from a consumer standpoint, there are a number of myths that hinder market expansion:

- Installation of natural gas is difficult, slow and it represents a big initial investment;
- Natural gas is more expensive than the alternatives in the long run;
- Natural gas is more dangerous than alternative energy options;
- Reserves of natural gas are decreasing, they are located in geopolitically unstable countries, and we will face a shortage in the short term.

There are also threats to natural gas consumption in terms of the alternatives the customer can choose if he does not consider gas as an option, such as:

- For heating, other conventional energies – electricity, liquid fuels, LPG or even coal, which for the most part, do not need new infrastructure;

Gas has an important role to play in a sustainable energy future from cooking (BELOW LEFT) to transportation (BELOW RIGHT).

- Alternative renewable energies leveraging on new legislation (and subsidies) aiming at CO_2 reductions;
- High efficiency technologies, fuelled by other energies, which reduce the economic distance from gas solutions (i.e. electric heat pump);
- Greater energy efficiency in buildings and processes that reduces energy demand, so reducing the savings from other energy potentially replaced by gas.

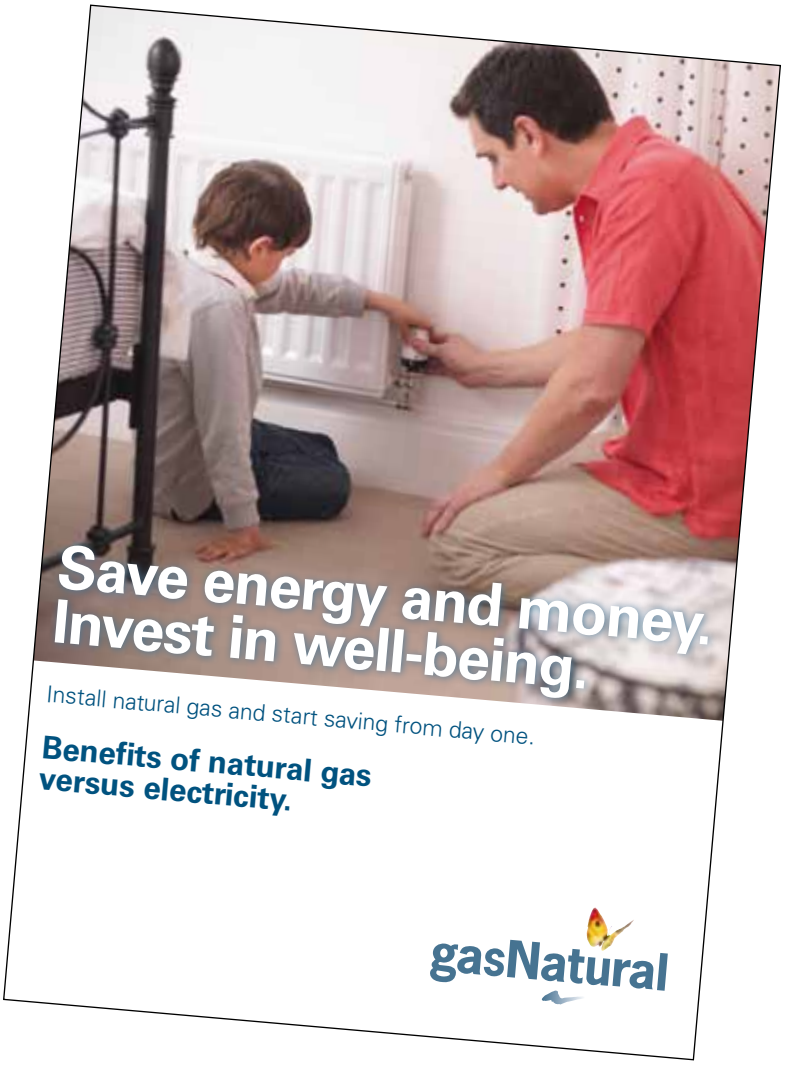
This experience has lessons applicable everywhere. The gas industry must develop simple, clear arguments to counter these myths and threats, explain the advantages of gas over other energy solutions and find the right fora to put these messages across. Unless gas has a voice the growth of the industry, and in some markets, the maintenance of its current market share, may be compromised.

Connecting to the customer

The objective of the gas industry is to increase market share of the primary and secondary energy markets. That is, to increase the uses of gas and the number of customers and, as a result, the amount of gas supplied. At the same time the industry needs to demonstrate to the general public that gas has an important role to play in a sustainable energy future as a clean and competitive energy for companies and households.

The awareness of customers of the benefits of natural gas tends to be in direct relation to the share of energy in their total costs. This is particularly the case for residential users and in warm regions with little need for space heating. In these cases customers tend to have a low level of knowledge of how competitive or efficient the energy they use is compared to the alternatives.

In this environment, natural gas is not a pull product, adopted by default once you have availability of service. Instead, it is a product that needs to be pushed and promoted. And here is where, as gas promoters, we face a triple consumer barrier of knowledge, attention and, finally, trust.



▲ The gas industry must develop simple, clear messages.

Besides working to achieve a favourable regulatory framework, the gas industry needs to reconnect with the customer, acknowledging their needs and wants. And connecting with customers means focusing on them rather than on products, satisfying the need for information that the customers have. It is not enough to have the best available energy anymore; the customer needs to be aware of that, and to be the right user for the product.

A consumer-centric strategy should be an expression of what the sector wants to be in the eyes of the user, ousting the image of an "old fuel". As PGC E has pointed out in the past, the industry must communicate with more aspiration, focusing on the customer on a more emotional level, connecting with stakeholders, and informing them of what they can expect from the industry. At the same time it

needs to answer their questions, disproving the false myths and offering good packages to address the real downsides (basically the initial investment due to the network expansion and the at-home installation).

This obliges companies to really understand what each customer needs and wants, appreciating that they are not homogeneous. A key differentiator, for example, is the energy supply a customer already has in place as this will affect the marketing strategy for gas. There are also differences in the way customers use gas, in its competitiveness versus alternative energies, in availability of supply and in the public perception of the product itself.

Proper market segmentation needs to be done when fighting for market share in a gas-gas competition and especially when promoting the use of natural gas to increase its share of the energy mix.

Market research and customer needs

Interest in alternative energies, in some cases subsidised, continues to grow and policy actions aiming to decrease greenhouse gas emissions limit the share of conventional fossil fuel energies. The time for making natural gas part of the overall clean energy strategy is now.

In that sense, focusing on the customer and the need for market segmentation becomes crucial. Several factors need to be considered when promoting gas such as different uses, market regulation, local purchasing power and GDP levels, the degree of saturation of the market, geographical and climatic conditions.

To simplify, we may classify markets according to gas penetration and usage levels:

- Mature markets in which penetration is high, promotional actions are often defensive and the battle is on gas-to-gas competition, cross selling and retention activities;
- Growing markets with major potential in which promotion is aimed at removing the existing barriers, with value-added services oriented at facilitating the access of new customers to gas.

However, the distinction between mature and growing markets is not exclusively geographical. In the same region we can have an already saturated market; while for other uses, it may be a growing one.

Nevertheless, geographical and weather conditions are relevant when segmenting the market for the natural gas business, especially for residential uses:

- *Severe winter climate* In this scenario, the economic benefit for the customer is more intuitive and palpable. Gas is associated with space heating and promotional activities focus on showing the savings and the local pollution benefits when compared with other energy solutions;
- *Warm climate* Here economic benefits are less tangible, as gas is mainly used for water heating and cooking. Gas-fired air conditioning is possible using a gas heat pump but this is suitable for larger consumers rather than residential ones. Promotional actions then focus on advantages relating to convenience (no need to store) benefits and improving sustainability in the region.

Once the basic segmentation is done and a target universe is achieved, further refinement is necessary. For example, in the case of residential customers, on top of factors such as age, gender, income, living alone, with a partner or with children, there is a greater need to know their motivations.

Gas Natural Fenosa carried out an extensive survey among recent and potential customers, and six profiles were created that took into account several factors:

- How much weight do customers give to comfort?
- How much effort are they willing to make?
- If they are family oriented, what is their perception of natural gas?
- Are they concerned about economy? If they are do they think long term in terms of the

At **Gas Natural Fenosa**, more than 22,000 people work every day to satisfy the energy needs of homes, industry and business, with the vision to be a leading energy and services group, in constant growth. That's how we have managed to supply our energy to more than 22 million customers in more than 25 countries around the world. Because we know that the only way to be bigger is to be closer.

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initial investment being covered by future savings or are they only concerned about the present?

Identifying the concepts we have to convey to the customer

During the 2009-2012 Triennium, IGU prepared a report on gas advocacy. This identified five main messages to get across to ensure a proper understanding and perception of natural gas amongst the various stakeholders. The messages were brought together in the acronym CARES, gas being Clean, Affordable, Reliable, Efficient and Secure. As suggested by PGC E at WGC 2012 in Kuala Lumpur, the industry needs to put "CARES" to work.

Natural gas is solving today's problems, while contributing to the long-term objective of combating global warming. The problems are related to urban pollution, safe energy usage, its affordability for many people, and sustainable economic growth.

Where should the industry get involved?

To date, gas promotion activities have been carried out almost entirely using traditional channels such as advertising and marketing to potential customers or energy prescribers of different kinds. Mass media advertising has been characterised by the use of institutional and generic messages and, in many cases, has been dominated by corporate brand building.

Existing marketing efforts should be heightened with a communication strategy that improves the image of natural gas on a different level. The aim is to create a pro-gas attitude amongst the general public by interviewing experts and managers of gas companies, as well as publishing popular articles and favourable opinion papers. The traditional channels also need to be enhanced:

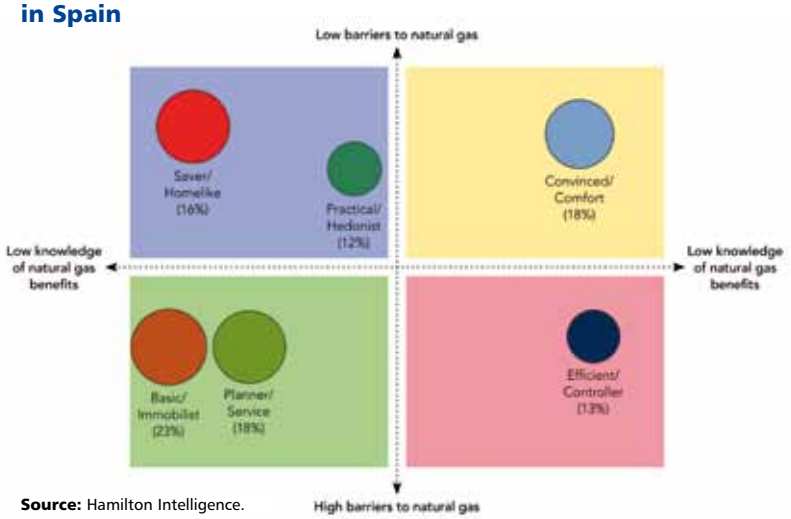
- Identification of different types of prescribers including third parties, such as designers, urban developers, installers, consumer associations and others, establishing information and collaboration channels;
- Attendance and participation in forums related to energy use, particularly in those with an active presence of consumers or prescribers;
- Create partnerships to promote the use of gas among customers, targeting a specific concern such as the need to reduce urban pollution related to car usage;
- Closer contact with government, national, regional and local regulatory bodies to create a good climate for gas.

Marketing efforts should also include the use of social media and the internet in a more innovative way. These efforts must not be limited to a gas company's website or online campaigns, but also use the sites of international associations to provide customers with the security of impartiality when demonstrating the overall benefits and putting more information at their disposal. Here are two examples:

- An online platform can be created that allows customers to create a budget for switching to natural gas and also allows comparison with other energy sources, allowing them to see the tangible savings they would obtain;
- According to Social Brands 100, which

▼ Market segmentation is crucial.

Strategic Segmentation of Potential Natural Gas Users in Spain



Source: Hamilton Intelligence.

benchmarks brand engagement in social spaces and identifies industry leaders, the first utilities company to appear in the list occupies position 78. There is a need to use social media to start a stronger dialogue with customers, creating a neutral online space for opinion influencers and customers to interact, talk and understand the true reality of natural gas.

At a user level it is through all these channels that the goal of giving gas a voice and proximity to customers must be achieved.

Who should lead and engage in this action?

Promoting the use of gas and creating a positive image is a responsibility of all market actors along the value chain. Traditionally gas retailers and distribution companies have shared the role of promoter given their proximity to consumers. However, producers and even pure infrastructure players also need to play a role in advocating for gas at different levels.

Current communications have focused in many cases on a B2B dialogue and trade associations are essential in that respect, but are not enough. We are not engaging sufficiently with other stakeholder groups that are of great importance – NGOs, think-tanks, academia, universities, media and online communities. We need to start talking to the customer (not only the person buying retail gas, also the professor, the industry specialist, the NGO member) and, most importantly, listen to what they have to say.

Granted there are risks in engaging in this kind of public communications strategy, but do we have a choice of staying out of the debate?

Conclusions

Unless the industry becomes focused on the customer and involved with the community, there is a risk of markets stagnating. Action is needed to enhance the perception of natural gas and promote a favourable public opinion, which in turn sets the basis for favourable energy policies, as the community pushes government actions.

Focusing on the customer is not easy; it requires time and tools in order to really get to know them. And this is a two-way path, it means engagement, commitment and listening to what the customer has to say.

In summary, gas companies must first listen to consumers and understand their needs. Second, the industry must convey the benefits of gas to different types of users and stakeholders in a clear and positive way. And third, it should engage with other stakeholders on advocacy so as to create a pro-gas environment that facilitates greater usage.

Alfredo Ingelmo Torres of Gas Natural Fenosa is the Chair of Programme Committee E – Marketing.

▲ Gas Natural Fenosa offers customers an energy budgeting tool called "el ahorrador" (the saver) as an app or online. "We don't know how you are going to spend it but we do know how much you can save" declares this advert.

What Makes a Good Leader?

By Barbara Jinks

One of PGC E's tasks during the 2012-2015 Triennium has been to look at what the gas industry can learn from how other industries market their products, especially other energies. This task was given to Study Group E.2. One key issue, we felt, was that leadership is highly influential in gaining people's trust and advocating the product. So we set about to see what leadership means to gas companies.

What makes a good leader? Leadership is elusive. Wikipedia defines it as "a process of social influence in which one person can enlist the aid and support of others in the accomplishment of a common task". It further states that "leadership, although largely talked about, has been described as one of the least understood concepts across all cultures in civilisation".

Recognising that executives are responsible for business success, we are interested in what makes certain people better leaders than others. Research from the previous triennium showed that the most common reason for people leaving a company is conflict with their direct supervisor or lack of respect for management. Following this, we conducted a survey for SG E.2 in the current triennium to find out what characteristics people admire in leaders they perceive as successful and what skills are expected to become more important in the next 10 years. Responses were received from 15 countries, including 22 managers, CEOs and senior consultants currently working in the gas industry. We also conducted several interviews. The following key issues were found.

Importance of communication

Firstly and most importantly, the results overwhelmingly show that people respect and follow those who have softer skills such as communication, vision and charisma – 82% of the respondents did not list a technical skill in the top five skills admired in leaders they know. This is in contrast to the older stereotype of a strong leader with business acumen and dominant traits. As Ghandi said, "I suppose leadership at one time meant muscles, but today it means getting along with people".

Characteristics most admired also include ethics, integrity, confidence, imagination, a positive attitude, patience, balancing work and home life, and the ability to manage both older and younger staff. It should not be a surprise that these skills are required to lead people, as business is people, and it is natural for people to look for inspiration. Martin Luther King famously said "I have a dream" to his followers – he did not say "I have a 10-point plan". Yet when discussing this subject with colleagues or asking an audience at a conference, it would be unlikely that you would meet anyone who has spent more time actively developing their "leadership skills" than training for technical or process-focused business management skills.

Ability to adapt quickly

Respondents feel that leaders in the gas industry need to improve their ability to adapt to challenges and improve stakeholder management skills, in particular when dealing with non-governmental organisations and political parties. Leaders also need to become more relationship-driven and acknowledge that "profit is important, but people are more important". One manager summarised this well by saying: "Stubbornness is no longer desirable to most organisations. Instead, empathy, humility and the willingness to adapt mark a great leader."

One consultant succinctly suggested, "society's expectations are changing rapidly and energy industry leaders will be forced to take a wider perspective on issues of social responsibility... leaders must: spend more time gaining learned advice on issues of environment, population and education; be prepared to make concessions to those who are not shareholders; and justify those who have the will to discard established business management and economic practices in favour of an approach which genuinely aims to improve the well-being of the wider community, and genuinely acknowledges the need to transition to a low-carbon future".

Diverse background

Respondents view a varied career background as the most valuable factor in developing leadership skills, even above education. This is important for younger professionals, as the older model of a company manager is one where promotion came after having been with the same company for a significant period of time. As Steve Jobs said, "I'm not dismissing the value of higher education; I'm simply saying it comes at the expense of experience".

Show you care

A strong theme throughout the survey is that it is important for leaders to show they care about the company and its people. This can be as simple as providing clear information, mentoring and succession planning but requires personal demonstration. Good questions are posed for us all to consider – why do you work where you do and what difference are you making? To quote Steve Jobs further on working: "You've got to have a problem that you want to solve, a wrong that you want to right."

One under-35-year-old gave the ultimate compliment about a manager she admired, saying: "She is a good leader because despite being extremely busy, she is dedicated in mentoring the next generation. Her success provides inspiration and direction."

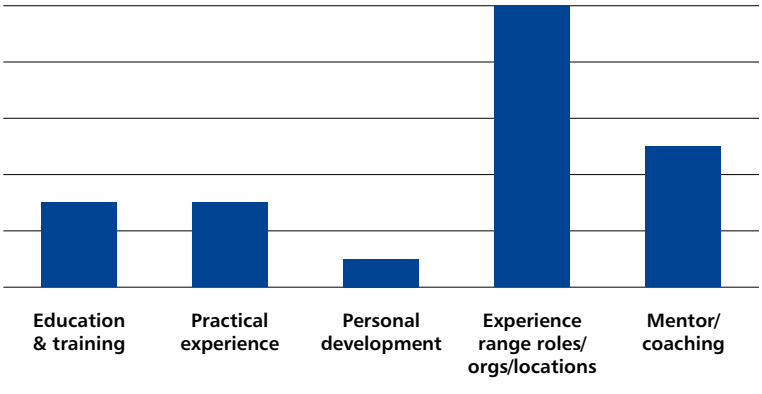
Communication is a vital leadership skill.

WGC 2015

We will be presenting the key findings of the leadership survey during SG E.2's WGC 2015 thematic session along with the rest of our work. Our overall aim for the session is for the audience to leave the room with an overview of how they could market their gas products better, best practice in other energy industries, tips on how to do better and actions that can be easily implemented in their own company.

Barbara Jinks (Executive Director of LNG 18) is the leader of Study Group E.2 and the Vice Chair of Programme Committee E – Marketing and Communication.

When asked to rate the factors that best develop good leadership, nearly half of survey respondents gave top ranking to experience of a range of roles, organisations and locations.



NGC
A Global Model of Success

When The National Gas Company of Trinidad and Tobago Limited (NGC) was incorporated in 1975, it was to act as a vessel for Government to capture value from natural gas development. Four decades on, the natural gas industry is thriving and NGC, at the heart of it, has burgeoned into a dynamic, diversified group of companies that is driving national development. Now, exciting prospects are in the pipeline as NGC gets set to go global.

Company Profile
The NGC Group is a diversified group of companies with an asset base of over US$7 billion, making it one of the largest companies in the Caribbean and Latin America by assets.

Though strategically positioned in the midstream of the natural gas value chain, NGC also operates in the upstream sector through its interest in oil and gas exploration and production, and compression of low pressure associated gas.

Its customers comprise power generation plants, world-scale petrochemical and metal reduction plants, and a wide range of light manufacturing and commercial enterprises. The Company's credit rating is A- from Standard & Poor's, Baa1 from Moody's and AAA from CariCRIS rating agencies.

Corporate with a conscience
NGC's raison d'être was to enable the nation at large to benefit from the country's resource wealth, and today its enormous contribution to Trinidad and Tobago's GDP sees this mandate being fulfilled. Beyond that contribution, however, the Company actively seeks to enrich the lives of citizens through various Corporate Social Investment undertakings in the areas of sport, culture, the arts, education and community development.

As an entity engaged in resource development, NGC also recognizes the need for operational sustainability and has made a commitment to reduce its ecological footprint through a reforestation initiative.

Moreover, in a pioneering effort to impact the bigger picture, it has embarked on a campaign to introduce Compressed Natural Gas (CNG) as a cleaner, cheaper fuel into the country's transportation sector.

Such an enterprise would return value not just in dollars and cents, but in improved environmental health.

Going global
Trinidad and Tobago is a developing nation that has experienced significant growth in recent years, and the country is poised to lead others through its example. Well-endowed with oil and gas, the nation has been able to successfully manage the monetization of its resources.

NGC's operations have been integral to that success, and this makes it an ideal business partner. In fact, the expansion into new and global markets is one of the Company's strategic pillars, and driven by this imperative, it is seeking to export Trinidad's model of natural gas-based development to other countries. It has already showcased its technical and operational expertise to several visiting international delegations, and given its stellar record of performance and alignment to global standards, the future promises NGC many opportunities for international joint-venture partnerships.

Key Facts
- *Asset base of over US$7 billion*
- *Engaged in purchase, sale, transmission and distribution of natural gas; developing and managing industrial site, port and marine facilities; extracting and selling natural gas liquids such as butane and propane, and upstream exploration and production of oil and gas*
- *Pipeline capacity of 4.4 bcf/d*
- *Long history of safe transportation of natural gas*
- *Credit rating of A- from Standard & Poor's, Baa1 from Moody's*
- *and AAA from CariCRIS*

THE NATIONAL GAS COMPANY
OF TRINIDAD AND TOBAGO LIMITED

Orinoco Drive, Point Lisas Industrial Estate, Couva
Republic of Trinidad and Tobago, West Indies
P.O. Box 1127, Port of Spain • Tel: (868) 636-4662 • Fax: (868) 679-2384
Email: info@ngc.co.tt • Website: www.ngc.co.tt

Empowering a Nation.
Inspiring the world.

NGC. A Global Model of Success

As a valued partner in our nation's natural gas-based energy industry, the National Gas Company of Trinidad and Tobago Limited (NGC) has a proven model of maximising resources for industrial development and long-term prosperity, applicable far beyond the shores of Trinidad and Tobago.

National Energy. Building Foundations for Economic Growth

NGC is a diversified, state-owned group of companies with an asset base valued at over US $7 billion. Among its pioneering subsidiaries are the National Energy Corporation of Trinidad and Tobago Limited, responsible for providing infrastructural and marine asset development for the energy industry, and Phoenix Park Gas Processors Limited (PPGPL), one of the largest gas processing facilities in the Americas and a preferred supplier of LPG to the region.

Fulfilling the Vision of a Sustainable Future

NGC is dedicated to sustainability, its community outreach and Corporate Social Responsibility (CSR). Our Corporate Social Investment (CSI) programme is one of the most extensive in the nation, focusing on the areas of sport, training and education, arts and culture, facilities development, human and social development and the environment. In addition, NGC is conducting a 10-year reforestation programme and applying a 'no net loss principle' by restoring areas of forest equivalent to that cleared during construction activities.

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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 as they make the final preparations to present their studies at WGC 2015.

Working Committee 1 – Exploration and Production

The fifth meeting of WOC 1 in the current triennium was hosted by Repsol in Madrid, Spain, September 23-26, 2014. The venue was Repsol's new headquarters, the award-winning Campus designed by Rafael de la Hoz. A total of 33 IGU delegates and authorities from 12 countries attended this meeting, including Víctor Peón, the Executive Director of Repsol's Gas and Power Division, Georges Liens, CC Chair, and Marta Margarit, Secretary General of the Spanish Gas Association, Sedigas.

In the opening plenary session Marta Margarit briefly described the important role played by Sedigas in the support of natural gas businesses in Spain. Following the recent European trend, Spanish gas demand decreased 8% in 2013 due to a significant fall in the demand of gas for power. However, consumption grew in all other sectors. One important reason for that is the excellent infrastructure in Spain, which could enhance security of supply in Europe if the Midcat pipeline to France interconnection project were completed. Other key issues for the Spanish gas industry include the effect of the Third EU Energy Package on Spain's transmission system and the development of an Iberian gas hub.

Víctor Peón emphasised the importance of natural gas for Repsol, as it accounts for nearly two-thirds of the company's total hydrocarbon production. Repsol is also the largest consumer of natural gas in Spain. The company has made significant discoveries overseas and now stands

▼ Víctor Peón, Executive Director of Repsol Gas & Power (*second left*), addresses the opening plenary of WOC 1's fifth meeting. He is flanked by WOC 1's Secretary Marcos de Freitas Sugaya (*left*) and Chair Denis Krambeck Dinelli (*right*).

in a comfortable position in terms of reserves and resources.

Georges Liens asked the selectors of contributions to the WGC 2015 technical programme to nominate six for each thematic and interactive session, plus two additional ones for a reserve list. He said that the strategic panel on unconventional gas was already finalised, but WOC 1 should work closely with the World Bank to define the contents of the strategic panel on gas flaring and venting reduction, which was still open.

WOC 1's Chair Denis Krambeck Dinelli (Petrobras, Brazil) summarised the progress and the pending issues to be tackled by each of the study groups that form WOC 1. He asked for volunteers to chair the five interactive sessions that WOC 1 will have at WGC 2015, and reminded delegates of the criteria established during the previous meeting in Seoul to rank the abstracts received by the committee.

A record 1,520 abstracts were received in response to the WGC 2015 call for papers. With 155 applications, SG 1.1's session on technological advances in gas exploration and production received the highest number by far. In total WOC 1 received 336 applications for its five oral panels and five interactive sessions. Each application was rated by at least three people during the study group meetings, and the best were forwarded to the session chairs for final selection.

SG 1.1 *Technical advances in gas exploration and production*

Leader (and WOC 1 Vice Chair): Adif Zulkifli (Petronas, Malaysia)

SG 1.1's meeting started with opening remarks by Adif Zulkifli who apologised for having been unable to attend the third and fourth meetings due to work commitments.

Ekaterina Litvinova (Gazprom, Russia) gave a presentation on Gazprom's major achievements in exploration, production and development in 2013. That October gas production started from the Kirinskoye field, where Russia's first subsea production facility is installed. Two months later Gazprom pioneered the development of the Russian Arctic shelf as the first oil from the Prirazlomnoye field was produced. Gazprom's presence in the LNG market was expanded with a final investment decision to develop Vladivostok LNG in Primorye and a memorandum of understanding for a plant in

Delegates to WOC 1's fifth meeting outside the Repsol Campus in Madrid.

the Leningrad region. Proactive work continued in international markets with local partners. Construction of the Bulgarian and Serbian sections of the South Stream pipeline started and the gas production from the Moc Tinh and Hai Thach fields offshore Vietnam was launched with PetroVietnam. Gazprom allocated record investments to the gasification of Russian regions, completed the construction of the country's most advanced combined cycle thermal power plant in Adler, commissioned its 22nd underground gas storage facility in Kaliningradskoye and switched all its refineries to Euro 5 fuels production ahead of schedule.

Next up was Zainal Abidin Zainuddin (Petronas, Malaysia), who gave a presentation on the activities of Petronas in the unconventional gas sector with a focus on operations in Canada. This included a case study on unconventionals that will be further developed in the triennial report of the study group. He highlighted operational challenges in well drilling, logistics and water handling, and the importance of technological innovation that can lead to cost and productivity breakthroughs.

Rashidah Karim (Petronas, Malaysia) outlined the content and topics that she has covered in the study group report, based on the contributions received so far. She explained that some topics need to be eliminated, since some of the study group members had been unable to contribute. She wrote up two case studies from presentations performed by colleagues from Gazprom and Petronas in previous meetings. Members from CNPC and KOGAS have also agreed to share materials that will be included in the report.

SG 1.2 *Assessment of global gas reserves and resources*

Leader: Mohammed Kaced (Sonatrach, Algeria)
The United States Geological Survey (USGS) is currently performing its first global assessment of undiscovered unconventional gas resources. Andrés Weissfeld (Tenaris, Argentina) will contact Dr Schenk at the USGS to find out if partial results would be available. Álvaro Ríos (Drillinginfo, Bolivia) will also support the elaboration of the group report with materials on unconventionals.

SG 1.3 *Gas rent and mineral property rights*

Leader (and WOC 1 Secretary): Marcos de Freitas Sugaya (Petrobras, Brazil)
Alexey Semenov (Gazprom, Russia) kindly prepared a presentation on the key elements of the unconventional gas revolution in North America, which was later included in the study group report. Taehyeong Lee and Kyungsick Park (both from KOGAS, Korea) also prepared an interesting written contribution on Tanzania for the report.

Final plenary and technical visit

In the final plenary, Álvaro Ríos defended the importance of predictive modelling to the grading of areas for the production of unconventionals, and the value of information sharing for the optimisation of results. These were of key importance to the development of the unconventional industry in the USA. Some interesting results were also presented on the Vaca Muerta play in Argentina, where data from more than 10,000 well logs are available and can be used to determine sweet spots and predict production.

Gulnaz Kolokolova and Marina Borisova (Gazprom Dobycha Yamburg, Russia) briefed delegates on preparations for WOC 1's last meeting of the current triennium, a joint one with PGC A in the Yamal-Nenets Autonomous District of Russia. This subsequently took place on February 3-6 with sessions in the cities of Salekhard and Novy Urengoy.

On the last day delegates visited Repsol's Technology Centre, which is widely recognised as a benchmark for energy research and innovation in Europe.

Proud of our history.
Focused on our future.

From Santos' origins in the Cooper Basin over 60 years ago to our diverse onshore and offshore operations today in Australia, PNG, Indonesia, Vietnam and Malaysia, our pioneering spirit continues to drive us toward new opportunities, new challenges and new horizons.

We're not simply an energy company. We're a company with energy.

santos.com

Santos
We have the energy.

▲ Delegates to WOC 2's fifth meeting in Copenhagen pose for a group photo.

Working Committee 2 – Storage

WOC 2's fifth meeting was hosted by Dong Energy and Energinet.dk at the Copenhagen Island Hotel in Copenhagen, Denmark, September 15-17, 2014. It coincided with WOC 5's meeting in the city and preceded IGRC2014. A total of 40 delegates from 11 countries attended with business focusing on the work programmes of the three study groups. In line with WOC 2's tradition a workshop was organised and for this meeting it was on energy storage. WOC 2 members also joined WOC 5's Danish session in the Tivoli Congress Center.

WOC 2's Chair Ladislav Goryl (NAFTA, Slovakia) welcomed delegates, thanked the Danish hosts for organising the meeting and invited them to give presentations. Leif Hansen (Energinet.dk) gave a presentation on the Danish distribution system and the operation of Lille Torup UGS which has a capacity of 420 mcm. Lars Bach (Dong Energy) looked at the company's activities in the Danish energy market. Dong Energy operates UGS Stenlille with a capacity of 600 mcm.

Georges Liens, CC Chair gave a briefing on the final report submission and process for reviewing WGC 2015 abstracts. After that, delegates divided into their study groups to discuss the progress of their work (see below for the individual reports).

Energy storage workshop

Looking at how to store energy from renewable sources at times of surplus generation is one of the main parts of SG 2.2's work. WOC 2 members and invited experts gave eight presentations during the workshop. All the presentations are available on the WOC 2 section of the Growing Together collaborative platform.

The presentation "Drawing on UGS Experience to Store Renewable Energy" presented by Jacques Grappe (Géostock, France) summarised a WOC 2 paper published in the last issue of the IGU magazine (October 2014-March 2015, pages 166-174). It provides information on the ways and the extent to which UGS techniques might contribute to storing surplus electricity generated from intermittent renewable energy sources and thus respond to some of the new challenges posed by the changes currently experienced in the energy sector. The presentation focused on the identification of solutions to which UGS applications might contribute, on the related technology gaps together with the R&D effort needed to overcome them, and on current market uncertainties, opportunities and

constraints likely to impact the deployment of these UGS solutions.

Günter Bayer (RAG, Austria) introduced a pilot energy storage project called Sun Storage Lehen. This is the flagship project of the Austrian Climate and Energy Funds Programme under the leadership of RAG and with NAFTA, Slovakia as a project partner. The project aims to prove the possibility of chemical storage of renewable energy, a mixture of methane and hydrogen in porous subsurface reservoirs. The main goal of the project is to research and obtain answers on the effects of hydrogen exposure to porous storage reservoirs with its focus to geochemistry, microbial metabolism, demixing, and corrosion effects. The project is divided into two phases with the first, which involves fundamental research at universities, underway. The construction and operation of an in-situ test bed facility is planned between 2015 and 2016.

The long-term goal of Danish energy policy, to cover the entire energy supply – electricity, heating, industry and transport – by renewable energy by 2050 was presented by Carsten Wittrup (Energinet.dk).

Hans-Åge Nielsen (Energinet.dk) explained the need to take an open view on the future business model for gas storage in a renewable energy system. New industry players will emerge and the energy sector will be even more integrated into other sectors. The core development will be efficiency in all links of the value chains and between value chains.

The Dutch HyUnder project looking at the economic feasibility of hydrogen storage in salt caverns was presented by Marije Wagter (Gas Terra, The Netherlands).

Isabelle Alliat (CRIGEN Research Centre of GDF Suez, France) introduced the GDF Suez vision on storage and briefly presented the technologies, among them compressed air energy storage (CAES). The main part of the presentation covered the French power-to-gas project for demonstrating hydrogen injection into the gas grid (GRHYD).

There were also presentations by Rene Peters (TNO, The Netherlands) on the role of UGS in energy storage and Grégory Fayet and Fabien Favret (EDF, France), who gave an overview of storage technologies and possible applications.

SG 2.1 *UGS database*

Leader: Vladimír Lorenc (NAFTA, Slovakia)

SG 2.1 is focusing on updating the worldwide UGS database. The new data visualisation proposal worked out by Igor Olejnik from NAFTA was presented and discussed at the meeting. Besides UGS this proposal includes major transmission lines and LNG regasification terminals in operation. The main issue of the work was to finalise the data collection from all countries. An action plan was agreed in order to collect all the data by the end of 2014 followed by data analysis and interpretation of the figures and trends during January. SG 2.1 had a subsequent meeting in Vienna on January 14 in the OMV offices in order to work on a draft of the final report.

SG 2.2 *Techniques and new opportunities*

Leader: Fabien Favret (EDF, France)

The structure of the final report was discussed and responsibilities confirmed, and the sessions at WGC 2015 were planned. Members discussed the approach towards further work and completion of the final report, which will

▼ Members of SG 2.1 at work on the UGS database during their meeting.

describe the status of the technology applied today. The topics which will be elaborated in the final WOC 2 report dedicated to best practices for operating UGS were agreed. Then the schedule for reviewing the draft of the report was settled. The most committed SG 2.2 members wanted to proof the final draft by the end of January to allow the final reviewing process by WOC 2 steering committee members to start.

SG 2.3 *Human resources: Attracting students to work in gas storage*

Leader: Nikita Barsuk (Gazprom, Russia)

SG 2.3's objective is to provide a status report on human resources and deliver some solutions for increasing the attractiveness of careers in the gas industry – especially in the storage sector. As part of its work SG 2.2 is analysing the gender, demographic and skill characteristics of people working in the UGS sector, and it was agreed that this data would continue to be collected until the end of December 2014. Due to a low response from potential participants in the competition to mark the 100th anniversary of UGS, members decided to extend the deadline for abstracts submission and send personal invitations to selected companies. However, in the end only 10 abstracts from young specialists were received.

Next meeting

At press time, the sixth meeting of WOC 2 was due to be hosted by China National Petroleum Corporation (CNPC) in the Sofitel in Xian, China, March 17-20. The meeting was being organized by PetroChina's Research Institute of Petroleum Exploration & Development – Langfang.

Working Committee 3 – Transmission

WOC 3 is chaired by Benjamín Guzmán (Transportadora de Gas del Sur, Argentina). The committee has 108 members who are organised in three study groups. The fourth plenary committee meeting and fifth study group meetings of the triennium were hosted in Prague by the Czech Gas Association (CGA) and NET4GAS, October 6-9, 2014.

Benjamín Guzmán welcomed delegates and the new committee members were introduced. After that CGA Executive Director, Jan Ruml spoke about the Association's role and the Czech gas industry with a focus on the market, the pipeline system and the storage of gas in rock caverns. He was followed by Radek Benčík from NET4GAS, who gave a presentation on his company and the Czech gas transmission system.

CC Secretary Yves Tournié briefed delegates on IGU developments and gave a presentation on the preparations for WGC 2015 with details

▼ Delegates to WOC 3's fifth meeting in Prague pose for their group photo.

PHOTO BY MICHAEL POLIZA/NATIONAL GEOGRAPHIC CREATIVE
Venice, Italy: a perfect combination of natural and anthropic factors has resulted in one of the most important lagoons in Europe. A network that demonstrates the importance of the synergy between man and the environment.

NATIONAL GEOGRAPHIC ITALIA

TBWA

We have drawn inspiration from nature to make the European gas network great.

We transport natural gas from Italy to Europe and from Europe to Italy, crossing countries and borders. We guarantee the country's energy security through a gas transmission network of more than 32,000 km, 8 storage sites, 1 regasification plant and a domestic distribution network of more than 52,000 km. Employing 6,000 men and women across our territories, we manage a gas network which is highly integrated with our natural surroundings. Because only by creating a network of values can we plan for a bright future.

SNAM

The network that respects the future.

▲ WOC 3's technical visit was to the Počerady CCGT power station.

of the conference programme, room allocation and other information of interest for the 26th WGC in Paris.

Then participants divided into their study groups to discuss the progress of their work. They reviewed the purpose and scope of each group, discussed the questionnaires developed to gather information, defined deliverables and agreed on the elements to be included in the final report to be presented at WGC 2015.

The second day was devoted to the plenary meeting. After a welcome address from Benjamín Guzmán, a presentation on public acceptance was given by Dimitri Schildmeijer (WPNT Europe, Belgium). There were also three technical presentations, namely:

- Strain-based pipeline design by Dr Nobuhisa Suzuki, P.E. (JFE Steel Corporation, Japan);
- Gas network modelling by Martin Stýblo (Simone Research Group, Czech Republic);
- Stakeholder management – an approach for gas pipeline projects by Carlos Sergio de C. Mazzei (TBG, Brazil).

Then the time came for each study group leader to present an activity report. There were also presentations on gas industry developments in the countries represented by a delegate in the meeting.

The meeting was very successful thanks to the excellent level of participation, the useful ideas put forward, the new proposals and the close collaboration among all members.

On the third day there was a technical visit to the Počerady CCGT power station, the first project of its kind in the Czech Republic. The 840 MWe facility is adjacent to the existing coal-fired Počerady power plant. Putting the new plant into operation will be completed through the certification of support services for the electricity transmission system.

SG 3.1 *New transmission projects,* SG 3.3 *Public acceptance and new technologies*

Leader: Peter Tóth (Eustream, Slovakia)
Deputy: Alessandro Moretti (Snam Rete Gas, Italy)

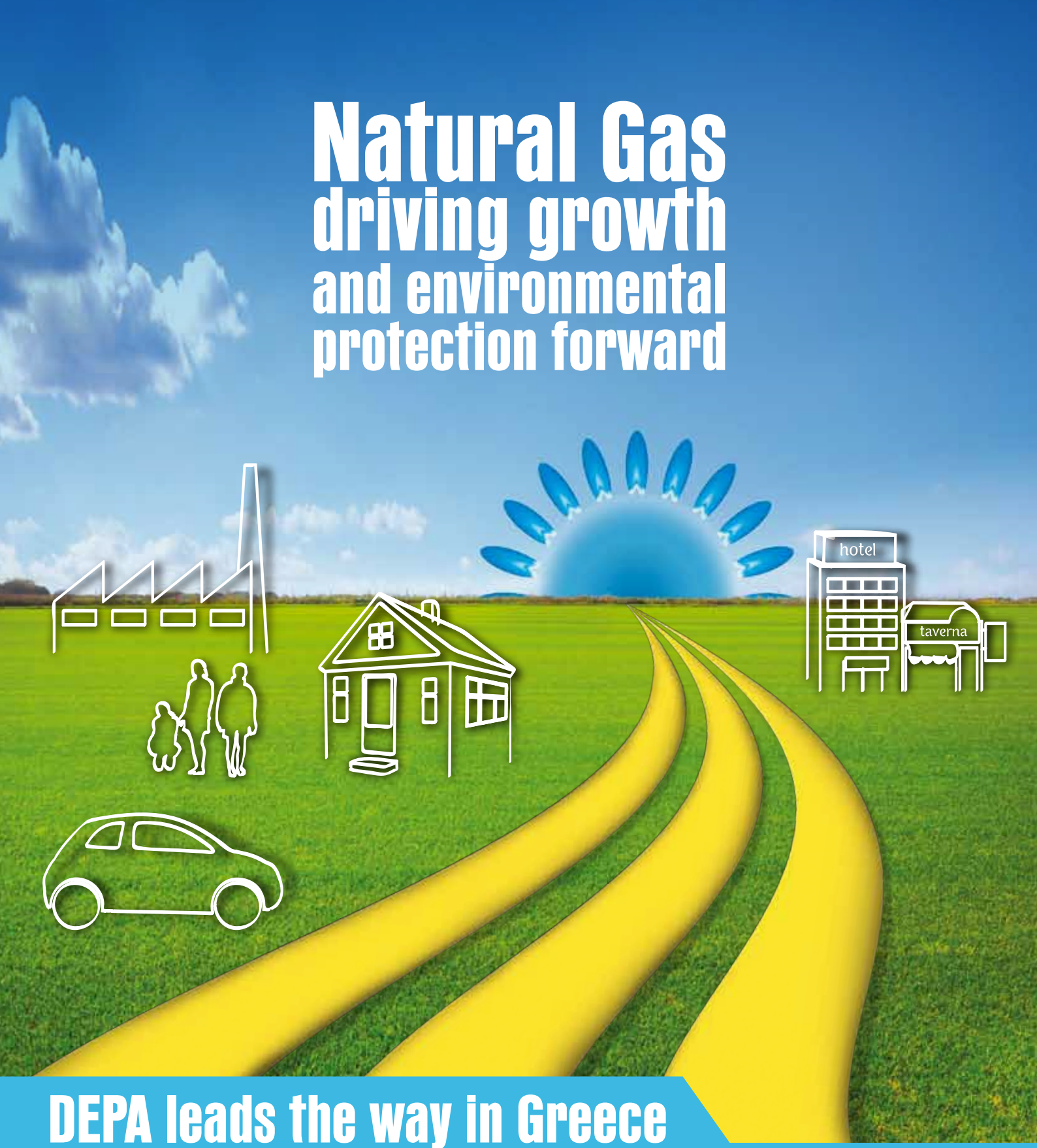
The activities of these study groups have been divided into five subject areas:

Transmission projects	Ansgar Brauer (E.ON, Germany);
Compression process	Peter Tóth (Eustream, Slovakia);
Tariffs and regulations	Mark Rand (Chevron, USA);
Public acceptance	François Crocombette (GRTgaz, France);
New technologies	Alessandro Moretti (Snam Rete Gas, Italy).

The final report will include descriptions of **14** major projects around the world:

1 Trans Adriatic Pipeline (TAP);
2 Capacity expansion Ellund-Egtved;
3 SK-HU Interconnector DN800;
4 Gazelle project;
5 Connection to Oberkappel;
6 Poland-Czech Republic interconnection within the North-South Corridor (STORK II);
7 Moravia;

Natural Gas
driving growth and environmental protection forward



DEPA leads the way in Greece

DEPA is the company that introduced natural gas to Greece's energy market by developing the necessary infrastructure and networks. It's a group of companies, consisting of the transmission system operator and three distribution companies. DEPA has a 50% stake in the company responsible for the construction and operation of the offshore gas pipeline connecting Greece with Italy and participates also in the company that will undertake the development and operation of the pipeline connecting Greece with Bulgaria. DEPA works for the further expansion of the natural gas grid in Greece, so that more consumers can benefit from the environmental-friendly energy solution.

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ΔΕΠΑ

8 Bidirectional Austrian Czech Interconnection (BACI);
9 Eastern Transmission Pipeline;
10 Eridan;
11 Nord Stream;
12 South Stream;
13 SP AusNet;
14 Power of Siberia.

SG 3.2 *Pipeline integrity management systems (PIMS)*

Leader: Abderrahmane Taberkokt (GRTG, Algeria)
Deputy: Mohd Nazmi (Petronas, Malaysia)
Integrity plans need to be enhanced in order to reduce risk of failure and accidents based on the PIMS approach. SG 3.2 is working to:

- Define a PIMS approach;
- Provide information on new developments to reduce the gaps in integrity threat management;
- Propose strategies to prolong the life of ageing pipelines or to reclassify the ones in use;
- Describe what governments, companies and suppliers are doing to improve third-party damage prevention (including the application of new rules);
- Identify the critical tasks that affect integrity management;
- Provide appropriate competency for personnel performing special tasks.

SG 3.2's tasks have been divided into the following topics and owners:

Ageing pipelines	Adnene Masmoudi (STEG, Tunisia);
Third-party damage	Noureddine Said (Sergaz, Tunisia);
Threats analysis	Deepank Gupta (Ausnet, Australia);
PIMS	Samir Akel GRTgaz, France).

Furthermore SG 3.2 members under the leadership of Abderrahmane Taberkokt are developing WOC 3's database of transmission systems.

The final report will include best practices, new technologies and lessons learnt about the following points:

- One call system;
- External corrosion;
- Composite repair systems – wrap and clamp;
- Remaining life prediction method, using in-line inspection (ILI) statistics – pigging and corrosion growth rate.

Next meeting

At press time, the fifth meeting of WOC 3 was due to take place in Oran, Algeria, March 17-19. For further information about WOC 3's activities, please contact the Chair at Benjamin_Guzman@tgs.com.ar.

Working Committee 4 – Distribution

The fifth meeting of WOC 4 was held in Vienna, Austria, September 30-October 3, 2014. It was organised by the Austrian Association of Gas and Water (ÖVGW) and hosted by OÖ Ferngas Netz and Energie Steiermark.

After a welcome from the Chair, Dietmar Spohn (Stadtwerke Bochum, Germany), there were presentations in the opening committee session from Manfred Pachernegg of Energie Steiermark on the development of gas regulation in Austria; Thierry Romanet of PII Pipeline Solutions and Reinhard Dumfart of OÖ. Ferngas Netz on ThreatScan, a new approach to pipeline supervision and monitoring; and CC Secretary Yves Tournié. In the following day's plenary session there were presentations from Konrad Peterka of OÖ. Ferngas Netz and Ewald Wahlmüller of Fronius on the injection of hydrogen into a gas distribution network, and Alexander Schwanzer of ÖVGW on new trends in the Austrian gas market.

In their individual study group sessions delegates discussed the work remaining and the rating of the 93 abstracts received for WGC 2015. WOC 4 will have three thematic sessions and is also organising a strategic panel with PGC F on smart grids in a sustainable future.

▲ Delegates to WOC 4's fifth meeting in Vienna pose for a group photo in front of a statue of Johann Strauss.

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

Leader: José Carlos Broisler Oliver (Comgás, Brazil)

SG 4.1 has been looking at how the regulation of TPA to gas distribution networks has developed over the last decade in different countries and is preparing IGU guidelines. Its final report will present different experiences around the world, identify trends and include a "World Map of TPA". SG 4.1 has contributed an article to this issue of the IGU magazine (see pages xxx-xxx).

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

Leader: Peter Flosbach (Westnetz, Germany)

Diversification of gas quality is becoming an important issue as new and varied (including unconventional) sources of gas enter supply streams. SG 4.2 is studying the options for managing such a diversification so that gas distribution companies can ensure stable supplies for their customers.

SG 4.3 *Smart grids in gas distribution: Scope and purpose*

Leader: Pascal Vercamer (GDF Suez, France)

SG 4.3 is looking at smart grids and their potential to improve gas distribution network design, operation and performance, as well as the likelihood of a coherent development with the electric power grid.

Final meeting

WOC 4's final meeting of the triennium was held in Prague, Czech Republic, March 2-6.

Working Committee 5 – Utilisation

Chaired by Eugene Pronin (Gazprom Export, Russia), WOC 5's fifth meeting took place in Copenhagen, Denmark, September 15-16, 2014. It was held just before IGRC2014 so the 59 delegates from 36 companies and 19 countries in Africa, Asia and Europe could make optimum use of their trip. The meeting and associated social activities were hosted by HMN Naturgas and co-hosted by Dong Energy and NGF at the Tivoli Congress Center.

To enhance the value of its get-togethers, WOC 5 traditionally organises a side event

▲ Members of SG 5.3 during their meeting in the Tivoli Center in Copenhagen.

looking at the host country and/or region's gas industry. In Copenhagen, the main working sessions were preceded by a half-day plenary giving an insight into the Danish gas market. There were 22 representatives from Danish companies, who shared their views and strategies with delegates. The following presentations were given:

- *"All energy supply covered by renewable energy by 2050: Scenario analysis for the Danish energy system"* by Flemming G. Nielsen, Danish Energy Agency;
- *"Danish field-test programme for fuel cell-based micro-CHP"* by Møller Melchior, Dantherm;
- *"Who is HMN Naturgas I/S?"* by Susanne Juhl, CEO;
- *"Danish Gas Technology Centre: Green gas R&D activities in Denmark"* by Thea Larsen, CEO;
- *"Future energy solutions"* by Tore Harritshøj, Managing Director, E.ON Danmark A/S.

WOC 5 has three study groups and two topic teams.

SG 5.1 *Industrial utilisation*

Leader: Egidio Adamo, (Eni, Italy)
SG 5.1 is preparing a report on trends in industrial gas usage; 12 members attended the meeting in Copenhagen.

SG 5.2 *Domestic and commercial utilisation*

Leader: Martin Seifert (SVGW, Switzerland)
SG 5.2 is looking at the promotion and use of gas heat pumps and micro-CHP units with case studies of seven national markets; 16 members were in Copenhagen.

SG 5.3 *Natural gas vehicles (NGVs)*

Leader: Miriam Eklo (GDF Suez, France)
SG 5.3 is preparing a report on NGV markets around the world; 16 members were in Copenhagen.

TT 5.1 *Renewable energy, CO_2 emissions, hydrogen*

Special Adviser: Aksel Pedersen (Dong Energy, Denmark)

TT 5.2 *Gas quality*

Special Adviser: Maryuli Rodríguez Malaver (PDVSA, Venezuela)

There were four members of the topic teams in Copenhagen.

The main business of the working sessions was to discuss preparations for WGC 2015 during which WOC 5 will have five thematic sessions. There will also be a strategic panel on gas as a transportation fuel chaired by the Chair and Executive Director of NGV Global.

Members of the study groups and topic teams agreed the criteria and methods for reviewing the abstracts received. They also discussed the final preparation of their triennial reports and summarised the activities carried out to date. The structures of the reports were defined, responsibilities assigned and timelines fixed.

Final meeting

The sixth and final WOC 5 meeting of the triennium was hosted by Vemex and the Czech Gas Association in Karlovy Vary, Czech Republic, February 25-27.

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▲ PGC A delegates pose for a group photo.

Programme Committee A – Sustainability

Chaired by Satoshi Yoshida (Tokyo Gas, Japan), PGC A's fifth meeting was hosted by the Finnish Gas Association and Gasum in Helsinki, Finland, September 10-12, 2014. It was attended by 27 PGC A members and one observer from WOC 2.

Delegates discussed the final draft of the committee report and prepared it for peer review by the other relevant committees. They carried on with the planning of the WGC 2015 sessions (PGC A will organise two strategic panels and four thematic sessions) and confirmed the criteria for the selection of papers. The selection subsequently took place in Berlin in October during the week of the Council meeting. PGC A organised a workshop on sustainable development and natural gas in conjunction with the CC during the Berlin meetings, and in Helsinki the final preparations for this were reviewed. The workshop included a guest presentation from Dr László Varró, Head of the IEA's Division for Gas, Coal and Power Markets.

There was a plenary presentation from the Finnish Gas Association on the gas industry in Finland and proposals for the country to become a Baltic energy hub by building an LNG receiving terminal and a pipeline to Estonia. There were also presentations from Gazprom on preparations for the sixth and final meeting in the Yamal-Nenets Autonomous District of Russia, and from Gasum on biogas production and utilisation in Finland. After the business sessions there was a technical visit to a biogas production facility at a wastewater treatment plant in the suburbs of Helsinki. The plant at Suomenoja, Espoo is operated by the Helsinki Region Environmental Services Authority. Some 3 mcm of biogas is produced from wastewater sludge through anaerobic digestion every year, and this gas is then upgraded and injected into the gas network.

SG A.1 *Carbon capture and storage*

Leader: Ichiro Fukuda (Tokyo Gas, Japan)

SG A.1 has a new leader with Ichiro Fukuda taking over from Susumu Nishio (Tokyo Gas, Japan). The study group's session in Helsinki began a review of the final stages of work on the report, which will explore the recent development and challenges with regard to CCS technologies, give an overview of the status of CCS projects around the world, look at the technical, legal and social issues, and consider the perspectives for CO2 utilisation. Members

also discussed the selection criteria for papers for the thematic session SG A.1 is organising on CCS and for the interactive session.

SG A.2 *Natural gas and renewable gas*

Leader: Elbert Huijzer (Liander, The Netherlands)
SG A.2 also reviewed preparations for its report and thematic session, which will look at the economic, environmental and social aspects of renewable gases like biogas, biomethane and biosyngas. The focus will be on case studies, projects or strategies to exploit the environmental and social benefits of renewable gases and to improve their economic potential. The topics of interest include: certification and trading issues; the economics of renewable gas projects and the need for financial incentives; international standardisation of sustainability criteria for renewable gases; LCA of a specific renewable gas chain; showcasing the social advantages of a successful project; and marketing, both in terms of the image of renewable gases and removing market barriers.

SG A.3 *Life cycle assessment of the natural gas chain*

Leader: Anne Prieur Vernat (GDF Suez, France)
SG A.3 has been working to create an international natural gas chain LCA database, covering both pipeline transportation and LNG. In Helsinki, members revised the draft report in order to be able to circulate a final version by the end of October. They also reviewed preparations for their thematic session and strategic panel.

The thematic session will set out to demonstrate how LCA may be applied to the natural gas industry and share some practical applications. It will consider greenhouse gas emissions and climate change, water footprint (linked both to scarcity and to water pollution), local impacts linked to atmospheric emissions and resources depletion. A variety of end uses of natural gas will be included, e.g. power generation, cogeneration, heating and transport, while production of conventional natural gas as well as unconventional gas or biogas/biomethane will be included.

SG A.3's strategic panel will demonstrate how LCA results can support strategic decision making and help answer stakeholders' expectations. Several experts are being invited to present their views and two have confirmed so far: Michael Wang of the Argonne National Laboratory in the USA, and Rana Pant of the European Commission's Joint Research Centre.

SG A.4 *Environmental aspects of unconventional gas (UCG)*

Leader: María Gabriela Roselló (Total, Argentina)
The change in SG A.4's leadership earlier in 2014 delayed work on the report. Its structure was agreed during the meeting in Helsinki and Andrew Kidd, who was CC Secretary during the Argentine Triennium, is helping with the final draft. Members discussed preparations for SG A.4's thematic session and the joint strategic panel with WOC 1.

The thematic session will look at best practices and technologies that help gain public acceptance of UCG production and reduce its environmental impact. Topics of interest include: improvements in the efficiency of hydraulic fracturing techniques and in well productivity;

▼ Members of SG A.2 at work.

clean hydraulic fracturing; water management and fracture flow-back management and reuse; social communication case studies and/or innovations; and the management of logistics and surface issues.

The joint strategic panel with WOC 1 will look at the main barriers that must be overcome if the UCG revolution in North America is to be replicated in other countries. These include: infrastructure requirements; fiscal incentives; regulations; business models; and best practices to improve performance and reduce the environmental footprint.

Final meeting

PGC A's sixth and final meeting of the triennium was a joint one with WOC 1. It was held in the cities of Salekhard and Novy Urengoy in Yamal-Nenets, Russia, February 3-6.

Programme Committee 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 a project identifying scenarios for the gas market by 2050. PGC B has three study groups. The committee's last meeting was hosted by the Slovak Gas and Oil Association in Bratislava, Slovakia, November 18-20, 2014.

SG B.1 *World gas supplies, demand and trade*

Leader: Thomas Dirksmeyer (E.ON, Germany)
The core of SG B.1's work is the collection of demand expectations and production forecasts from regional experts who regularly contribute to the study group. Making use of regional expertise is one of the major assets that this study group can boast. In the current triennium, the focus was on consolidating a global supply and demand balance from the regional input data, and on positioning this result against the background of renowned forecasts from around the world. Featured articles on trends of the global LNG trade and on the challenges for European gas demand constitute the second part of the report.

PGC B's Chair Fethi Arabi addresses the committee's fifth meeting. With him are CC Chair Georges Liens and PGC B's Secretary Malek Benabdallah.

▲ PGC B delegates pose for a group photo.

SG B.2 *Wholesale gas price formation study*

Leader: Mike Fulwood (Nexant, UK)

At the Bratislava meeting presentations and discussions on the draft report to be presented at WGC 2015 in Paris were completed. Work is in progress to compile the final data set and complete analysis for the final report.

SG B.3 *Strategy and regulation*

Leader: Francisco de la Flor Garcia (Enagás, Spain)

SG B.3's work has been very diverse due to the topics which were selected to be studied. In the first place, it was intended to continue the work of the prior triennium. For this reason the study group has continued to analyse whether there are synergies between regulation and the strategies of the companies. Some interesting results have been found.

Due to the increasing interaction between the International Confederation of Energy Regulators (ICER) and IGU, SG B.3 considered that there could be a potential role for IGU to provide some input to ICER on the current investment climate. ICER has also included this topic in the current work programme and said that the voice of the gas industry would be welcomed. The study group has developed a position paper which will be used to voice the interests of the gas industry vis-à-vis ICER.

Thirdly, SG B.3 considered that the interaction between IOCs and NOCs is a relevant topic which is changing the global landscape of energy companies. In this sense, the study group has gathered input from different project sponsors who have explained why these partnerships were successful in developing specific projects.

Lastly, energy poverty was studied. Many initiatives are being developed with regards to this issue, and the study group has tried, via a questionnaire, to understand the different situations and measures that countries are facing or have put in place.

2050 natural gas prospective study

PGC B is analysing phase results of this study which looks at issues affecting supply/demand in the 2050 perspective. It will focus on qualitative rather than quantitative issues and in particular on very long-term ones, and assess disruption possibilities.

PGC C delegates pose for a group photo.

Programme Committee C – Gas Markets

PGC C's fifth meeting was hosted by Gazprom Marketing & Trading (M&T) in London, UK, September 2-4, 2014. The meeting was attended by 18 members from seven countries (Australia, Indonesia, Japan, Korea, Russia, the UK and USA), the CC Secretary, six invited speakers and three spouses. In addition, there was one observer, Ross McVey (Gazprom M&T, UK office).

The chairman, Gi Chul Jung (KOGAS, Korea), reported that PGC C held a tripartite meeting with WOC 1 and PGC A on March 1-3, 2014 in Seoul, Korea, which was attended by the KOGAS President, Seokhyo Jang and IGU CC Chair, Georges Liens.

A special workshop was held in the plenary session with six speakers invited to address various topics in the global gas market. Among the speakers, Victor Buchman (Gazprom M&T, Swiss office) gave an overview of his company and the gas trading business, while Mike Smith (BP, UK) looked at the energy and gas market in the UK. Scott Atha (Gazprom M&T, US office) spoke about the evolution of LNG in the context of global gas markets. Ben Hollins (WoodMac) presented on the topic "Gas into Europe: Drivers, Impacts and Opportunities" followed by Hether Forgan (WoodMac, UK) who talked about unconventional gas development in Europe. Meanwhile, Julian Bowden (BP, UK) gave a talk about the European security of gas supply.

Mohsen Dourandish (NIGC, Iran) was scheduled to give a presentation about the Iranian gas market and LNG project but was unable to attend the meeting so Gi Chul Jung gave a presentation on the topic instead. The presentations were accompanied by interesting discussions between the speakers and the audience.

The committee members agreed to evaluate the abstracts via circulation of the drafts rather than meeting for evaluation.

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

Leader: Alexey Biteryakov (Gazprom, Russia)
The group recognised the fact that the completion of the report is behind schedule, so Alexey Biteryakov (Gazprom, Russia), leader of study group C1, chaired the meeting and discussed about the redistribution of work with SG C.1 group members.

Alexey Biteryakov will preview the shortlist of all abstracts submitted for participation in the Committee session in the Congress. In addition, all study group members decided to participate

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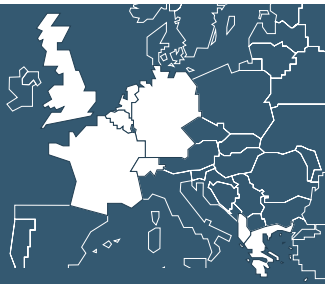

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in choosing the speaker of the session in the Congress.

SG C.2 *Implications of developing unconventional gas*

Graeme Bethune (Energy Quest, Australia), sub-group leader of Asia Pacific, gave a presentation of Asia Pacific which includes the progress of Australian CSG-LNG projects, Asian market imports of LNG, and the status of the other LNG suppliers' exports to Asian Markets as well as USA and Russia. Scot Atha (Gazprom M&T, USA) joined the group discussions and made comments on Asian LNG markets. On the other hand, Mikhail Uchkin (Gazprom, Russia) and Nak-Gyun Kim (KOGAS, Korea) gave presentations on the status of unconventional gas developments in North America, and the new North American LNG projects.

The group continued its discussion on the implications of developing unconventional gas and confirmed that there is progress in the report although its completion is a bit behind schedule. The final draft for the Committee will be prepared by December, 2014.

Final meeting

The final PGC C meeting of the triennium will be hosted by the Indonesian Gas Association in Bali, Indonesia, April 7-9.

Programme Committee D – LNG

PGC D's fifth meeting was hosted by the Malaysian Gas Association (MGA) in Melaka, September 22-25, 2014. Ho Sook Wah, MGA Secretary General, and PGC D's Chair, Dirk van Slooten (VSC Hattem, The Netherlands) welcomed participants in the opening plenary session. There were also presentations on Petronas with a focus on the company's LNG activities by Khairuddin Abdul Khalik, General Manager of the Optimisation and Market Research Department, Petronas LNG, and on preparations for WGC 2015 by CC Secretary Yves Tournié.

The main business in the individual study group sessions was to review progress on the reports (all draft reports were ready for review) and discuss the work to be completed in time for the sixth meeting in January. Members also discussed the process for evaluating the 135 abstracts received for PGC D's four thematic sessions during WGC 2015.

SG D.1 *Remote LNG*

Leader: Jorge Gomez de la Fuente (Repsol, Spain)

SG D.1 has a new leader with Jorge Gomez de la Fuente taking over from Simon Frost. In general terms, remote LNG production involves sites which are far removed from any logistically developed centre, and therefore usually involve extreme conditions. These projects demand a special approach in terms of design, construction and operations. SG D.1 is evaluating the challenges and will make recommendations for future developments with LNG production greater than 3 mtpa. It has developed a "Remoteness Index" for the report which includes regional studies on the Arctic, Asia-Pacific and East Africa.

SG D.2 *LNG as fuel*

Leader: Richard Lammons (Chevron, USA)

SG D.2 has carried out a comprehensive analysis

PGC D's Chair, Dirk van Slooten addresses delegates during the meeting in Melaka.

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PGC D delegates pose for a group shot during a technical visit to the Petronas regasification terminal in Melaka.

of LNG as an alternative fuel for transportation, remote power and fixed facilities in land and marine applications. The report has chapters looking at emissions and regulations; fuel options and engines; end users; LNG distribution; the value proposition; and health, environmental and safety issues. The aim is to provide information and resource references to potential consumers and suppliers considering the feasibility of switching to LNG, which offers cost savings and a reduced environmental footprint.

SG D.3 *Small-scale LNG*

Leader: Wouter Meiring (Shell, The Netherlands)
SG D.3 has studied the options, opportunities and challenges for LNG facilities with a capacity of less than 1 mtpa. The aim is to provide an overview of potential regions/countries of interest as well as tailor-made technical requirements/solutions. The report has chapters looking at drivers and business models with a regional analysis of current and future projects; players across the value chain and regions; small-scale LNG economics; technology; and safety, standards and regulations.

SG D.4 *LNG life-cycle assessment*

Leader: Ted Williams (American Gas Association)
SG D.4 is carrying out a life-cycle assessment (LCA) of the LNG chain and its report has been divided into two parts. Part one is aimed at a general IGU and public audience to give them the background on LNG, LCA and the potential contribution of LCA to improving environmental performance. Part two is aimed at environmental and LCA specialists with a standards-compliant LCA inventory based on modules making up LNG chains. The modules are liquefaction, transportation, regasification and end-use delivery.

SG D.4 has been collaborating with the Center for LNG in Washington DC, USA to support data development for air emissions from LNG chain modules. SG D.4 is also coordinating its LCA efforts with SG A.3, which is conducting LCA for the broader natural gas chain and including natural gas production, transport and end use.

SG D.5 *Annual World LNG Report*

Leader: Philippe Corbière (Total, France)
IGU's World LNG Report provides up-to-date information on LNG liquefaction plants, carriers and regasification terminals and is an important reference document for the industry. SG D.5 has been responsible for producing three reports during the current triennium and has worked with consultants IHS.

The 2015 edition will be launched during the WGC 2015 strategic panel on LNG. This will be

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chaired by Marcel Kramer, IGU's Regional Coordinator for the Russia-Black Sea-Caspian area. There will be four panellists, two representing buyers and two sellers. This last World LNG Report of the triennium will contain four special reports, being the summaries of the study group reports.

Final meeting

PGC D's final meeting of the triennium was hosted by Qatargas in Doha, January 26-29.

Programme Committee E – Marketing and Communication

Chaired by Alfredo Ingelmo Torres (Gas Natural, Spain), PGC E has two objectives. On the one hand, it seeks to identify and develop ideas, tools and products that successfully promote and sell natural gas. On the other, it seeks to define effective ways to convey the merits of natural gas and its role in sustainable development and in a clean economy.

PGC E's fifth meeting was hosted by Gasunie in Rotterdam, The Netherlands, September 29-October 1, 2014. It was attended by 23 of the committee's 69 nominated members.

▼ Delegates to PGC E's fifth meeting pose for a group photo during a tour of the Port of Rotterdam.

SG E.1 *Marketing natural gas and promoting new usages*

Leader: Luis Pinto (Shell, The Netherlands)

The SG E.1 session during WGC 2015 will highlight the best practices of individual companies, industries and countries in their successful promotion of alternative uses of gas, and find ways to replicate them in other markets. The focus of the analysis is on how the gas market expands (inter-fuel competition and new business models to sell gas).

The abstracts submitted have been reviewed and selected by the study group. The next step in the preparation of the final report is to complete the analysis of feedback from the survey on alternative uses for gas. There will also be analysis of global marketing campaigns within and outside the industry to gauge their effectiveness and success in order to highlight this during the WGC session. SG E.1 will present three case studies:

- France – GrDF's marketing approach to achieve ambitious customer acquisition goals;
- Australia – Envestra's marketing campaign to increase home connections and gas appliance sales;
- "Got Milk?" – a US milk campaign as the case study from outside the gas industry.

SG E.2 *Competing and coordinating with other energies*

Leader: Barbara Jinks (Gas industry advisor, Australia)

For its WGC 2015 session SG E.2 is pursuing the following objectives:

- Encourage the audience to learn new ways of being effective in communicating the gas message;
- Inform the audience of what other industries are doing to communicate their message more effectively than the gas industry;
- Learn from speakers in the gas industry who will outline ways of being effective in communicating the gas message. In addition, proven marketing tools and strategies used

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▲ SG E.2 Leader, Barbara Jinks addresses a work session.

by other industries will be analysed;

- Speakers are encouraged to present in engaging ways including the use of graphics or videos and interacting with the audience.

The abstracts submitted have been reviewed and selected by the study group. The content of the work being developed includes:

- Results from the global leadership and internal communications surveys;
- Present case studies of gas marketing campaigns (in Australia, France and The Netherlands);
- Present examples of effective marketing campaigns by other industries.

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

Leader: Hansch van der Velden (Gasunie, The Netherlands)

SG E.3 promotes knowledge sharing and debate on public acceptance.

The study group organised a keynote speech and workshop on public acceptance at IGRC 2014 in Copenhagen last September as well as a workshop during the Council meeting in Berlin last October (see pages xxx-xxx). In 2013, Hansch van der Velden was the moderator of the 17th European Gas Conference in Oslo, where public acceptance was a key theme. He also spoke at the European Autumn Gas Conference. Member, Dimitri Schildmeijer (WPNT, Belgium) gave a speech on public acceptance at the Sedigas 2013 annual meeting in Madrid. Earlier, the group published an article in Natural Gas & Electricity entitled "Golden Age of Gas? Not in My Backyard" (December 2012, see http://db.tt/npoEil3t).

SG E.3 is preparing recommendations for IGU to be presented in a WGC 2015 thematic session using video, slides and an interactive panel with Q&A. The abstracts submitted have been reviewed and selected by the study group. The report will present a model for public acceptance and lessons learned from case studies in Australia, France, Ireland, The Netherlands, Poland, South Africa, Spain, the USA and elsewhere.

Finally, SG E.3 advises and supports the IGU Secretariat in its ambition to become a more active voice in the global gas debate. The study group acts as a soundboard for the development of a new global gas portal and IGU advocacy and communications strategy. It advised the Secretariat on the IGU press release of November 2014 as a reaction to the publication of IEA's World Energy Outlook 2014.

i-gas Industry: Contribution to a special report

Leader: David Konvalina (RWE Transgas, Czech Republic)

All study groups are covering this transversal topic looking at the impact of online and digital 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.

Final meeting

PGC E's final meeting of the triennium (a joint one with TF 1) was hosted by BDEW, the German Association of Energy and Water Industries, in Berlin, March 2-4.

Programme Committee F – R&D and Innovation

The efforts of PGC F are focused on advancing technology innovation and collaboration impacting the spectrum of the natural gas industry – from exploration and production through utilisation. The committee tasks and activities address large-scale conference and meetings as well as highlight notable technology area that have promise impacting aspects such as industry growth, safety and operational efficiency.

Development and implementation of advanced technology has contributed to the robust global supply portfolio, particularly through the development and promise of unconventional gas supplies from shale and coal-bed methane resources. The security and price implications from expanded supply have impacted downstream technology aspects such as infrastructure development and gas utilisation topics. Each of the value-chain segments of the gas industry is driven through application of technology and innovation.

To address key gas research and innovation topics in the industry, PGC F is continuing progress with three study groups under the chairmanship of Dr Jack Lewnard (Chesapeake Utilities, USA). The committee's fifth meeting was held in conjunction with the IGU Research Conference (IGRC2014) in Copenhagen, Denmark in September 2014. The sixth and final meeting of the triennium was held March 10-11 in Rio de Janeiro, Brazil, the site of IGRC2017.

SG F.1 *Technical Programme for the IGU Research Conference (IGRC2014)*

IGRC2014 was held in Copenhagen, Denmark from September 17-19, 2014. Please see the report on pages 166-169.

SG F.2 *Development of international gas RD&D collaborative programmes*

SG F.2 is focused on developing a framework for broader international collaboration in gas research and innovation. In light of decreasing resources allocated towards R&D activities, there is an increased need to identify and promote collaboration and cost-savings opportunities amongst the global gas industry research community. The study group is addressing this need through development of a global database of current R&D facilities and programmes. The initial task, which will be reported on at WGC 2015, is developing an inventory of global R&D programmes and facilities to establish a baseline level. Follow-on tasks investigate business models for gas R&D in terms of short- and long-term drivers, and the intrinsic value from research and technology investments. Deliverables will include a database of natural gas R&D facilities, capabilities and programmes as well as frameworks for inter-company and international cooperation.

SG F.3 *Convergence of gas with electric and renewable energy*

SG F.3 has been working to identify and characterise new business models that anchor natural gas as part of the future energy mix. This activity will be the focus of an oral session at WGC 2015 as well as documentation in a study group report. Examples include scenarios with gas augmentation of renewable geothermal and solar energy for heating and cooling loads, or as back up for intermittent electricity production from renewable sources. The gas grid also has enormous potential to provide energy storage. Given these scenarios, the gas infrastructure becomes critical for integrated energy grids that holistically manage electricity and thermal loads. SG F.3 is working on specific tasks that include identification of innovative technology and business models to maximise the value of gas and integration, and the relationship with renewable power and electric distribution systems.

GSPC Group – Securing Energy for India

Gujarat – one of India's most progressive states with a positive development quotient has always capitalised on its strength to leverage strategic opportunities. Strategically located on the west coast of India, Gujarat, with a coastline of 1,600 kilometres is well connected to all the major sea-based trade routes, such as USA, Canada, Europe, Australia, China, Japan, Gulf and African countries and other major trade cities of the world by air.

Energy has always been a leading driver of a society's growth and development. Energy consumption in India continues to increase consistent with the demand for sustained economic growth. Under the aegis of the Government of Gujarat; as a "Complete Energy Conglomerate" the Gujarat State Petroleum Corporation (GSPC) Group companies collectively have a presence in the upstream, midstream and downstream sectors of the Energy Value Chain – from exploration and production to gas transmission and city gas distribution, including gas-based power generation.

In the upstream segment, Gujarat State Petroleum Corporation (GSPC), the parent company of GSPC Group, is engaged in exploration and production, having working interest in oil and gas in India and overseas. GSPC is also playing the critical role of demand aggregator in the State of Gujarat and is ensuring availability of gas across all sectors. While Gujarat acts as a "Gateway of India" with two major operational LNG terminals located on its coastline, GSPC has started entering into long-term contracts with international LNG suppliers, besides establishing its own LNG receiving and regasification terminal in Gujarat.

Gujarat State Petronet Limited (GSPL), a subsidiary of GSPC, has emerged as a leading gas transportation company in the midstream segment. GSPL has already implemented a State-wide gas transmission grid of 2,600 kilometres and it is in the process of implementing two major cross-country pipelines of approximately 4,000 kilometres.

To reach retail gas customers, GSPC Group has developed three city gas distribution (CGD) companies which have laid a gas distribution network supplying piped natural gas (PNG) to more than 1.1 million domestic households (including rural areas) and 3,000 small and medium industrial companies. Also operating a widespread network of 250 compressed natural gas (CNG) stations refuelling 200,000 CNG vehicles daily. GSPC Group CGDs are ensuring that gas is adequately available to all retail segments in Gujarat with the highest standards in customer service and HSE (Health, Safety and Environment).

GSPC Group has also launched an initiative to address the need for trained and specialised human resources in the domains of engineering and management with a special focus on the oil and gas sector, establishing Pandit Deendayal Petroleum University (PDPU), which is heading to gain excellence and become a world class university in energy education and research.

The future-focused and vibrant state government of Gujarat has envisions the development of the State of Gujarat as a "Natural Gas-based Economy" and GSPC Group has established a significant presence across the energy value chain to realise the vision of the Government of Gujarat.

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Progress Reports from the Task Forces

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

Task Force 1 – Human Capital

TF 1's fifth meeting was held in St Petersburg, Russia, October 7-8, 2014. It coincided with the Fourth St Petersburg International Gas Forum, which took place in a new exhibition centre called Expoforum.

The meeting was attended by 18 members and was hosted by Georgy Simonian, Deputy General Director for Human Resources Management at Gazprom Export. He welcomed delegates before handing over to TF 1's Chair, Agnès Grimont (GDF Suez, France). She thanked the host and underlined the importance of TF 1's work, notably the organisation of the WGC 2015 Youth Event and the study report on human resources.

CC Chair Georges Liens attended the meeting to give a briefing on the progress of the Triennial Work Programme as well as preparations for WGC 2015.

Each day of the conference is dedicated to one of the four themes or "pillars" of the French Presidency and the theme for Friday, June 5 is "Human capital for the future of the gas industry".

TF 1 is organising two strategic panels and one thematic session during WGC 2015 and received 33 abstracts. At press time, the selection of papers to be presented was being finalised.

After the meeting Abdulaziz Al Mannai (Qatargas) stood down as Vice Chair and was replaced by Reem Mohammad Al-Harami. As Madeleine Lafon (AFG, France) has taken over as Secretary from Sonia Lefebvre, this makes

▼ TF 1's fifth meeting was hosted by Gazprom Export in St Petersburg.

TF 1 the first of IGU's working groups to have an all-female leadership.

Youth Event

Marc Mopty (GRTgaz, France) and Raoudha Jribi (ETAP, Tunisia) briefed delegates on preparations for the WGC 2015 Youth Event, which is being organised by a team of young professionals.

The event will have a high visibility during the WGC with the Youth area in the middle of the pavilion where the main conference sessions will be held. This will allow young graduates to mix with gas industry professionals. Some 200 people are expected to attend and the sessions will be highly interactive to encourage delegates to share experiences. A logo has been designed to brand marketing materials and registration is open via dedicated web pages and a pop up on the WGC 2015 website.

There are two levels of sponsorship: €50,000 (with maximum visibility) and €15,000. At press time, six sponsors had been confirmed.

For more details on the Youth Event see the separate article on pages 96-98.

Survey

The last part of the meeting was dedicated to an overview of the preliminary results of the survey on human resources run by Marius Popescu (Energy Brains Consulting, Romania). Questionnaires were sent out to 100 companies and replies were received from 76. Major findings of the survey show that:

- Technical skills are the hardest to find and companies find it difficult to hire and retain young people;
- Analytical, technical and behavioural skills are considered to be the most important when hiring young people.
- Regarding recruitment some new media are emerging (e.g. LinkedIn);
- Active cooperation programmes with academies are becoming more popular (especially in the Americas);
- In general there is little sponsorship available for science, technology, engineering and mathematics (STEM) students;
- The biggest barrier to international recruitment is the compensation package, while the language barrier is also an issue in Asia;
- The female application rate is low for all the

▼ TF 1 delegates pose for a group photo.

companies. For 30% of the companies, women represent a third of the workforce;
- Individual career programmes are more developed than carrier ladders;
- The skills shortage is greater in Africa and the Middle East and is therefore a particular focus of attention for companies in this region;
- People tend to stay in the gas industry either leaving a company to go to another in the industry or to retire.

TF 1 members decided that it would be interesting to introduce a typology of companies by region in the final report although specific companies will not be identified.

The findings of the IGU-UNESCO workshop on Women in Engineering held in December 2013 will be published as a hard copy document which will be available at WGC 2015.

Final meeting

The final meeting of TF 1 was a joint one with PGC E and took place in Berlin, Germany, March 2-4.

Task Force 2 – Gas Advocacy

TF 2 is close to the finish line of this triennium. Chaired by Michele Pizzolato (Eni, Italy), the Task Force is continuing its efforts to sustain the essential role of natural gas in the global energy mix.

As a "voice" for natural gas, TF 2 has supported the Presidency in lobbying activity. It has produced a position paper on capacity remuneration mechanisms and a covering letter to present the report on shale gas prepared for the last World Gas Conference to selected institutional stakeholders.

As agreed in the fourth meeting of the triennium, which was hosted by the French Gas Association (AFG) in Paris, December 1-2, 2014, TF 2 is finalising the advocacy actions that it has been developing during the triennium.

Competitive relationship between coal and natural gas

Although the positive environmental performance of natural gas is widely appreciated, some markets are experiencing a growing

▼ Delegates to TF 2's fourth meeting pose for a group photo at the AFG headquarters in Paris.

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role of coal in power generation. TF 2's members have collaborated in order to reach a global view on the issue and the Task Force is releasing a position paper on the policy actions that could establish a balance between natural gas and coal, taking into account the environmental aspects with reference to all the pollutants.

Capacity remuneration mechanism: gas for power security of supply

Gas-fired plants are characterised by low emission levels and high efficiency levels. They use the cleanest fossil fuel technology in support of renewable energy sources to meet the balancing needs of power demand. Where markets do not recognise the value of flexible power generation capacity, they should recognise the strategic value of gas-fired generation plants. In particular, the differential in negative externalities originated by the power generation sector using coal instead of gas should be valorised as well as the flexibility that CCGT plants put at disposal of the power system in order to support variable renewable power generation. Taking into account the ongoing situation, TF 2's members are developing a new advocacy plan for the paper prepared at the beginning of the triennium.

▼ Jérôme Ferrier addressing the IGU-IPI roundtable in Paris.

Natural gas as a fuel for sustainable transportation

Natural gas has strong potential for further development as a fuel for passenger and heavy duty vehicles. Increasing use of NGVs could play an important role in improving air quality.

Furthermore, the potential offered by the use of gas in lorries and both inland waterway and maritime shipping should be fully recognised and reflected in future policy measures all over the world. In particular, it should be acknowledged that LNG bunkering could make a major contribution to reducing CO_2 and SOx emissions. TF 2 is collaborating with WOC 5 in order to support it in advocating the policy measures needed for the proper development of this market.

Task Force 3 – Geopolitics

Roundtable

TF 3, in collaboration with the International Peace Institute (IPI), hosted a roundtable entitled "Threats and Opportunities for the Energy Sector in West Africa" on September 9, 2014. The roundtable was held in Paris at the Institut Francais des Relations Internationals (IFRI) under the Chatham House Rule of non-attribution. The following synopsis was kindly prepared by IPI (www.ipinst.org).

Participants included energy consultants, security and risk experts from oil and gas companies active in the region, analysts from local and international think tanks, the Director of Energy for the ECOWAS Commission, the Chairman of the West African Power Pool, and IGU President Jérôme Ferrier. They were briefed on energy and security in West Africa by Ogunlade Davidson, a professor at the University of Sierra Leone and the country's former Minister of Energy and Water Resources.

In a paper prepared for the meeting, Prof. Davidson noted the region's great potential including 3% annual economic growth rates and significant hydrocarbon resources, particularly in Ghana and Nigeria. However, he also outlined considerable challenges including: a

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spill-over of instability from the collapse of governance in Libya and civil war in Mali; fragile stabilisation processes in Côte d'Ivoire, Liberia, and Sierra Leone; terrorism (particularly from the Nigerian Islamist sect Boko Haram and al-Qaeda in the Islamic Maghreb); drug trafficking; piracy (in the Gulf of Guinea); the spread of the Ebola virus; corruption; weak governance; and unequal development.

Participants noted that most recent discoveries of oil and gas in the region are offshore, and this is creating vulnerability to piracy in the Gulf of Guinea. The attack on a Shell oil platform in June 2008 was also recalled. It was observed that "problems offshore stem from problems onshore", in the latter case due to the rebel Movement for the Emancipation of the Niger Delta. Furthermore, it was estimated that between 75,000 and 150,000 barrels of crude oil are stolen every day in the Niger Delta region – a massive loss to the state treasury.

The threat posed by terrorist groups like Boko Haram as well as groups operating in northern Mali was discussed. Lessons learned from the terrorist attack on the In Amenas gas refinery in Algeria in January 2013 were recalled, particularly those outlined in a report prepared by Statoil. The need for better intelligence sharing between host governments and multi-national companies was underlined.

The situation in Nigeria was given special attention since it is by far the region's biggest energy producer. It was noted that lessons learned from Nigeria should be applied elsewhere (particularly Ghana which is rapidly increasing offshore oil production) to deal with issues like corruption, unequal development, gas flaring, and avoiding the "resource curse".

The impact of energy on the geopolitics of the region was discussed, for example the decreasing engagement of the United States (due to domestic fracking) and the increased interest of China, India and Gulf countries.

The impact of energy on human security and socio-economic development was discussed, including how to strengthen transparency, integrity and accountability in relation to oil and gas revenues, how to overcome energy poverty, how to ensure access to electricity (particularly in rural areas), and how to reduce the health risks associated with burning firewood and charcoal. The issue of energy subsidies was raised. Some participants underlined the need to lower subsidies and create a more rational system of gas pricing in the region, while others cautioned that his could increase prices for consumers and trigger energy riots.

The impact of energy on the environment was stressed, for example in relation to gas flaring, oil spills, the destruction of mangrove forests, deforestation, desertification, as well as climate change. It was noted that these threats can harm livelihoods, and even cause displacement.

It was observed that while West Africa produces considerable amounts of oil and gas, most of it is exported. It was stressed that more must be done to convert gas to electricity, and to invest in renewable energy.

Because of the size and costs of developing energy-related infrastructure, participants highlighted the need for public-private partnerships, the involvement of development banks, as well as sub-regional cooperation.

In a good example of how energy can be a source of cooperation rather than conflict, one participant highlighted a recent project where Côte d'Ivoire is supplying electricity to communities in Liberia despite recent tensions along the border. It was also pointed out how energy can promote regional trade, development and cooperation. Examples cited included the West Africa Gas Pipeline (from Nigeria, through Benin and Togo to Ghana), and a planned electricity project involving countries of the Mano River Union, namely Côte d'Ivoire, Liberia, Sierra Leone and Guinea.

It was concluded that the issue needs greater political attention and support. It was therefore suggested that the observations and recommendations of the roundtable should be

presented to the recently formed African Energy Leaders Group (championed by Dr Kandeh Yumkella, a member of IGU's Wise Persons Group) as well as the Conference of Energy Ministers of Africa.

Workshop

By Georgia Lewis

Following the roundtable, TF 3 organised a workshop during the Council meeting in Berlin. This was held on October 15, 2014 and was moderated by Prof. Coby van der Linde, a member of IGU's Wise Persons Group. The "Natural Gas in Geopolitics – A Global Perspective" workshop covered a broad range of challenges facing governments and operators across the world. With a particular focus on China, Russia, Germany and the USA, the four panellists explained how local natural gas issues are part of a broader, international picture.

Prof. Shi Ze, Energy Director, China Institute of International Studies looked at the expanding gas market in China and energy relations with Russia, in particular the deal agreed in May 2014 for China to import Russian gas. While the partnership offers enormous benefits for both countries, Professor Shi said China still needs to improve and enhance its technology and Russia needs to improve the investment climate. He also said that reform of China's gas pricing is needed to reduce government subsidies for gas imports while not pricing consumers out of the market.

Prof. Shi said the relationship China has with Russia in the energy sector is a long-term one of strategic importance and downplayed the impact of the Ukrainian crisis. "China and Russia have made progress because of domestic demands in both countries and the Ukrainian situation is not a factor in this," he said.

▼ China-Russia energy relations were a major focus of the TF 3 workshop in Berlin – Zhang Gaoli, First Vice Premier of China's State Council (*second left*) and Russian President, Vladimir Putin (*third left*) shake hands during celebrations to mark the welding of the first joint of the Power of Siberia pipeline in September 2014.

Prof. Leonid Grigoriev, Chief Adviser to the Director General of the Analytical Centre of Russian Government, and Head of the Department of World Economy, Research University – Higher School of Economics, agreed with Prof. Shi's analysis. Reviewing the global energy outlook and developments in Russia, Prof. Grigoriev stressed the importance of long-term investment in the gas industry and said the economic slowdown in the EU is a "problem for all". He added that across the EU markets in particular, a level playing field is not being achieved in relation to renewables. "We are fighting different battles – some countries can better afford sustainable energy investment," he said.

Germany's Energiewende (energy transition) policy, which promotes renewables and has had a significant impact on the use of gas in power generation, was the focus of the presentation by Dr Carsten Rolle, Head of Department for Energy and Climate Policy at the Federation of German Industries (BDI). He pointed out that as the share of renewables in the energy mix increases so do the challenges of intermittent power generation, i.e. the need for back-up power generation on the one hand and storage and export of excess energy on the other. This requires investment and ultimately consumers have to foot the bill but, he pointed out, energy prices in Germany are already high.

"There has to be more international and more European cooperation with a level playing field, such as sufficient grid capacity between EU member states, common support schemes, regional cooperation, and a consistent and balanced EU energy policy," he said.

Gregg Kantor, President and CEO of North West Natural Gas, USA, gave a presentation on the work the US gas industry has done in terms of reducing emissions and transforming the US energy mix with the shale gas revolution. He looked at the plans for substantial LNG exports and was asked to speculate on whether the US might become a similar player in the global natural gas market as Saudi Arabia is in the oil market. He offered cautious optimism on this prospect and said that long-term contracts are essential to underpin the development of new export plants.

The panellists discussed the challenge the gas industry faces from cheap coal. Although gas has displaced coal in the US, in China coal accounts for 65% of the primary energy mix, according to Prof. Shi. Reducing the reliance on coal, he said, depends on "the extent of technical development… and the need to promote gas rather than coal for power generation".

Prof. Grigoriev and Mr Kantor expressed concerns about Germany's increasing reliance on coal as a back-up fuel with renewables. The move to coal in Germany was described by Prof. Grigoriev as "pragmatic" but he urged caution as the over-reliance on coal is "a global problem". Mr Kantor contrasted Germany's imports of coal with the use of fracking in the US to increase domestic shale gas production. But Dr Rolle was not optimistic that the German government would reverse the moratorium on fracking.

Dr Rolle posed the following questions about the situation in Germany in regard to heavy coal use: "Many hope that gas is the perfect partner for renewables but is there any hope on the horizon? Is it possible to take out coal [when] we do not see comprehensive capacity for gas?"

It was suggested that governments could enact constructive policy changes to help open up the gas market and facilitate gas development. Questions were asked by delegates about whether a less interventionist framework could be achieved while still meeting environmental and social concerns.

There was also a call from Mr Kantor for greater knowledge about energy. He said that an educated populace and educated elected officials and policymakers are required.

At the end of the workshop, Prof. Coby van der Linde summed up the main issues raised and the importance of getting messages across to policymakers.


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Features

This issue's features section starts with a review of IGRC2014. Then we have reports from three of IGU's Regional Coordinators, an update on global pipeline construction plans and an overview of the LNG projects starting up in 2015 to mark the launch of IGU's latest world LNG report.

The LNG focus continues with articles on the global LNG carrier fleet and LNG 18, followed by a message from the General Manager of the Society for Gas as a Marine Fuel.

Next up are updates on GTL developments and the Technology Centre Mongstad, a report on IGU's diplomatic symposium in Oslo and profiles of IGU's new members.

We round off with a list of the publications available from the Secretariat and the events calendar.

IGRC2014: Gas Innovations Inspiring Clean Energy

By Peter Hinstrup, Jack Lewnard and Gerald Linke

The International Gas Union Research Conference 2014 (IGRC2014) took place in Copenhagen, September 17-19 in the Tivoli Congress Center. IGU's Charter Member for Denmark, the Danish Gas Association (DGF) was the official host; the Danish Gas Technology Centre (DGC) planned and executed the conference on behalf of DGF.

The mission of the triennial IGRCs has been updated from one conference to the next, reflecting the current situation of the gas industry and R&D. The focus in 2011 was on sustainability; for IGRC2014 there was a crucial new twist to the theme brought about by developments such as the global financial crisis, plans for phasing out nuclear power and the continuing demand for energy security and a stable energy supply at a reasonable price.

Peter Hinstrup addresses the IGRC2014 opening ceremony.

These and other factors have led to a wider understanding that the gas system is an essential part of any cost-effective and viable solution to providing a greener energy future. Governments and NGOs are beginning to realise that if we are to achieve a low-carbon future without jeopardising our standard of living and future development options the gas industry must play an important role.

The gas industry has the infrastructure (pipelines, storages, etc.) and the energy products (natural gas, biogas, renewable natural gas, synthetic natural gas, etc.) that are needed for stabilising the coming energy system with increasing input from intermittent renewable energy sources such as wind, solar and bioenergy.

This new situation should be welcomed as a challenging new opportunity for the gas industry – a situation that calls for a rethinking of the business model so that gas supply is seen more closely in connection with renewables and other green technologies.

New technology is fundamental to this business re-engineering process and the mission for IGRC2014 was to showcase how new gas technology and R&D will help shape the modern business model for the gas industry in the low-carbon energy future. The conference theme was "Gas innovations inspiring clean energy".

Technical programme

The technical programme for IGRC2014 was developed by Study Group F.1 of Programme Committee F, which also reviewed the abstracts. More than 750 abstracts were submitted during the call for papers period and the conference programme comprised the top-ranked selec-

▲ Lillian Parker Kaule, member of the Copenhagen City Council, addressing the welcome reception for delegates in Copenhagen City Hall.

▲ Ulco Vermeulen, Managing Director Business Development & Participations at Gasunie moderates a debate between Michael Weinhold, Chief Technology Officer of Siemens Energy and Seok-hyo Jang, former President & CEO of KOGAS.

▲ The NRG Battle – World Edition took place during IGRC2014. Teams of talented young minds were brought together to solve real energy challenges. The battle featured challenges from GDF Suez, DNV GL, Gasunie and Energinet.dk. Teams presented their ideas before a jury of experts, and the winners received tickets for a trip around the world.

tions from the submitted abstracts as well as invited keynote speakers.

The final programme included more than 400 papers from 38 countries representing all the regions of the world. Papers were presented in 20 oral sessions, eight workshop sessions and 10 poster sessions covering innovations, technologies and best practices for the entire gas chain. Attendance at IGRC2014 exceeded 750 participants from 46 countries and it proved a very informative and engaging event for all participants.

Key messages

Collaboration in gas R&D

IGRC2014 saw an increase in the number of papers presented by teams that included multiple organisations, including research institutes, universities and start-ups partnering with private companies, as well as international consortia in collaborative programmes.

Financial support for gas R&D

The traditional model for vertically integrated gas utilities, with internal R&D budgets, has increasingly been challenged by market forces and business developments such as deregulation. Concurrently, government funding has contracted in many countries. Attracting and retaining research personnel requires a long-term commitment. The path forward is not clear – collaborations can pool funds, and reduce duplicative programmes. However, the industry needs a new business model to ensure gas research is adequately supported.

Gas production becomes "localised"

Several papers addressed the potential for regional gas production, which complements long-distance transmission as a source for gas. For example, results were presented for renewable gas via anaerobic and gasi-

fication processes, as well as "power-to-gas" concepts for hydrogen and methane from electro-chemical and electro-biological processes. There is significant potential to tap unconventional fossil gas resources, which are geographically more widespread than conventional gas.

Impact of gas acceptance

The conference provided both technical depth and visions for the future of gas. For example, life cycle analysis can quantify the environmental and economic benefits of gas, and provide a consistent basis for comparison among energy sources. Many papers detailed advances to minimise the environmental footprint of gas across the value chain. But we need to do more to reach out and engage stakeholders. Concepts such as power-to-gas provide a framework for positioning gas as part of a sustainable energy future. The NRG (Energy) Battle provided a framework for engaging young professionals in the challenges and benefits associated with the gas industry. Researchers need to engage actively with stakeholders outside the gas community to ensure gas takes its proper place in the energy mix.

Gas in the transportation sector

Although transportation is one of the largest energy markets, gas has a relatively small share. Several papers and panels explored how gas can capture a broader share of this market, including the millions of vehicles that use a relatively small amount of fuel each day; the thousands of locomotives that use modest amounts of fuel; and the hundreds of ships that use very large volumes of fuel. Each market aggregates to a large amount of gas, and each has its infrastructure and technical challenges. However, both economic and environmental drivers incentivise increased gas use, so we expect to see further commercial advances by the next IGRC conference.

Awards

The Dan Dolenc Award (€10,000) was given to a paper by Julien Duclos, Dominique Gosselin and Philippe Buchet of GDF Suez entitled "High-temperature gas heat pumps to recover industrial waste heat".

The young researchers' prize (€3,500) was given to a paper by Andreas Hielscher, Christian Fiebig, Roland Span, Peter Schley and Joachim Schenk of Ruhr University Bochum entitled "Gas quality tracking in distribution grids with Smartsim – a new kernel for flow calculation".

GERG, the European Gas Research Group, held its 6th GERG Academic Network Event at IGRC2014. Seventeen students presented their current research work in a poster session and three prizes were awarded.

The next IGRC will take place in Rio de Janeiro, Brazil in 2017.

Peter I. Hinstrup was the Conference Director of IGRC2014. Dr Jack Lewnard of Chesapeake Utilities is the Chair and Prof. Dr Gerald Linke of DVGW is the Vice Chair of Programme Committee F – R&D and Innovation.

▼ Gerald Linke and Jack Lewnard sum up the key messages of IGRC2014 during the closing plenary.

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Promigas service more than 2.8 million users, 40% of the Colombian natural gas market.

Also, as part of its investment portfolio, Promigas operates and maintains around 21,838 km of electrical power distribution networks, supplies more than 300,000 users in 38 communities in the southern part of the country and provides services for the hydrocarbon industry, including gas compression and dehydration; maintenance of gas pipelines, oil pipelines and other ducts; construction of gas pipelines and interconnection lines; and develops energy solutions including generation, auto-generation and cogeneration.

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Reports from the Regional Coordinators

Following contributions to the last issue from IGU's Regional Coordinators for North America and South America and the Caribbean, we have reports from the Regional Coordinators for Asia and Asia-Pacific; Europe; and Russia, the Black Sea and the Caspian.

▲ Kang Soo Choo.

Growing Reliance on Imports in Asia and Asia-Pacific

By Kang Soo Choo

The Asia-Pacific region is the fastest-growing gas market in the world. Demand for gas is expected to increase up to 75% by 2025, and the region is going to need domestic natural gas, pipeline imports and LNG to meet this growth.

A key change for the natural gas markets in Asia-Pacific is the growing reliance on imports, in particular, LNG imports. Aside from South Korea, Japan and Taiwan, importing LNG is relatively new for Asian countries. India started in 2005, China in 2006, Thailand in 2011, Indonesia and Malaysia in 2012.

It is apparent that the natural gas imports to the Asia-Pacific region occur mainly in the form of LNG. About 63% of world's total LNG imports go to the Asia-Pacific region. According to IGU's *World LNG Report 2014*, LNG trade in 2013 was 236 MT, slightly below the record of 241.5 MT in 2011, showing the surge of global gas demand while Asia is expected to be the area of the largest LNG supply growth.

Moreover, in the report, IGU President Jérôme Ferrier was quoted saying that "global gas demand is surging, nurtured by a growing preference for low-carbon energies and uncertainty over possible Korean and Japanese nuclear policies. The world is keenly awaiting new LNG supplies from the US, although some uncertainty remains over the actual number of liquefaction projects that will start delivering soon."

New reports also showcase the promising future for LNG bunkering in the Asia and Asia-Pacific region. An IEA special report as well as BP's *Energy Outlook 2035* projected the transportation sector as a promising area in the coming decades. In Asia-Pacific, countries such as South Korea and China have invested substantially to develop LNG as a bunker fuel. As a result, the demand for LNG bunker fuel in the region is anticipated to grow steadily.

Another important point related to the natural gas market in Asia-Pacific is the review of the formation of a gas trading hub. The trading of natural gas in the region is dominated by long-term contracts in which the price of gas is indexed to that of oil. As the price of natural gas between Asia and other parts of the world has widened in recent years, Asian countries have raised questions on the sustainability of the current pricing system.

Asia is working out how to develop a gas trading hub and facilitate the emergence of a market as well as prices that better reflect supply and demand. However, building such a hub takes a lot of effort and time, and thus, further discussions are expected in the future to deal with the building of an Asian gas trading hub.

Lastly, I want to mention the falling oil price. From 2010 until mid-2014, the world oil price had been stable at around $110/bbl. But since June last year, the oil price has fallen by more than 40% going below $50/bbl at one point.

The oil price is partly determined by actual supply and demand, and partly by expectation. The main reasons for the tumbling oil price are weak demand in many countries due to

slow economic growth coupled with surging US production.

According to the consulting firm IHS, the decline in oil prices should boost GDP growth in the Asia-Pacific region by 0.25% to 0.5%. Most countries in Asia, including South Korea, Japan and China, benefit from the price decline because they are oil importers. In consequence, LNG prices in Asia, where oil linked long-term contracts prevail, are expected to fall in coming years due to the impact of lower oil prices.

Kang Soo Choo, Honorary Chair of the Korea Gas Union, is the Regional Coordinator for Asia and Asia-Pacific.

A True Energy Union is Based on Trust in Market Fundamentals

By Gertjan Lankhorst

Market mechanisms are the most effective and efficient means to form a true energy union, whether its objective is securing supply or reducing emissions. Reform of the EU's Emissions Trading System (ETS) and creation of a true internal market are crucial steps to reach these goals. The energy union could play a significant role in making this happen.

Last year was a very turbulent year for the energy sector, especially in the European gas market. Undoubtedly, the perceived risk to society that gas supplies could be disrupted is the first issue that comes to mind. While this issue rose on the agenda in many boardrooms and on those of the highest levels of policy-makers, Europe welcomed a new Commission which presented its ideas on Europe's energy future in a concept that we now know as the "energy union".

The energy union as it was presented rests on five pillars: security of supply; a competitive internal energy market; emissions reduction; moderation of demand; and research and innovation. To illustrate how these pillars are supported by market mechanisms, I will elaborate on two of them.

Looking at security of supply, the question the energy union seems to face is: how could Europe be more attractive for different suppliers from various parts of the world? The answer is short: when suppliers trust the European market. In this regard, trust is based on a predictable environment and a level playing field with a stable framework of rules. Besides, European companies that supply gas to end users need flexibility; that is the possibility to procure gas from different sources: both conventional and unconventional indigenous gas, pipeline imports, LNG and the ability to withdraw gas from storage. It is clear that a completed and strong internal energy market will result in this kind of diversification.

Another very important pillar is emissions reduction. We have to move to a more sustainable society. The announcement by the European Commission in October 2014 of an emissions reduction target of 40% is dedicated to achieving just that, with the ETS acting as the cornerstone of this policy. In other words, this pillar is also based on market fundamentals, which makes it the best instrument for delivering efficient emissions reduction. And trust is again vital. After all, the trust of investors is essential to bring about technological development. The market will decide which technology is most cost effective. In hindsight, we have learned that the unexpected oversupply of emissions rights, partly caused by the financial crisis, undermined confidence in the system. A reform such as the Market Stability Reserve that is currently being debated, could restore trust and create the strongest incentives towards a more sustainable Europe.

▲ Gertjan Lankhorst.

In short, the pillar of security of supply is inextricably bound up with the pillar of the internal energy market. Market mechanisms are pivotal to achieving the goals of the energy union as described by the European Commission.

Gertjan Lankhorst, CEO of GasTerra, is the Regional Coordinator for Europe.

▲ Marcel Kramer.

Recent Developments in Russia, the Black Sea and the Caspian

By Marcel Kramer

Among the many regional gas-related developments of recent months there are two that have attracted particular interest: concerns over supply to and through Ukraine and the replacement of the South Stream project by Turkish Stream.

First, efforts have been and are being made to maintain an adequate gas flow throughout the winter to Ukraine and through Ukraine to Russia's European gas customers. Commercial parties (mainly Gazprom and Naftogaz) and government officials met a number of times to discuss the state of affairs and possible solutions, including a scheme to ensure adequate payment from now on for the gas to be received. The agreed scheme (the "winter package" of October 30, 2014) appears so far to have been sufficient basis for a flow of gas to and through Ukraine, which has prevented a supply crisis situation from developing. However, concerns have been expressed by Gazprom over low Ukrainian storage fill levels and their possible impact.

Several countries in Southeast and Central Europe are calling for infrastructure investment and new supply contracts that would reduce their dependence on transit through Ukraine. Key questions are what the essence of a new regional supply/interconnection plan would be, what the sequence of infrastructure investments would be and, most importantly, how these would be funded.

The second development, which brought a particular sense of urgency in Europe to the infrastructure planning issues described above, was the decision by Gazprom to halt the South Stream pipeline project. This was planned to deliver approximately 64 bcm of gas to Europe through four Black Sea pipelines running from Russia to Bulgaria. South Stream included a major onshore pipeline investment plan for Southeast Europe with a significant Gazprom contribution. Major obstacles for the project quoted by Gazprom were significant difficulties and uncertainties around the realisation of the project in Bulgaria, where the landing point for transit into Southeast Europe was foreseen, as well as the general regulatory climate in Europe which is seen as discouraging large cross-border gas infrastructure investments. The cancellation took place in December 2014 as offshore construction was about to enter a first major phase.

Gazprom acquired the shares of the European partners in South Stream Transport BV (the Dutch company held by Gazprom, Eni, Wintershall/BASF and EdF responsible for the Black Sea pipeline crossing) and announced that an agreement had been reached with the Turkish government to "divert" the gas pipeline project from landing in Bulgaria to Turkey, with a new landing point north of the Bosphorus.

Part of the gas delivered through the new Turkish Stream system (some 14 bcm through the first line was mentioned) would be sold to Turkey, and a volume of up to 50 bcm would eventually become available "on the Turkish/Greek border" for deliveries from that point into the EU. Detailed technical work is underway to define the details of the Turkish Stream project in which Botaş and Gazprom cooperate.

As mentioned above, Greece and the former South Stream destination countries in the EU now need to decide what additional infrastructure they will need to build themselves (i.e. now without Gazprom's direct investment in their territories) in order to be able to make optimum use of significant Russian gas supply options at the border between Turkey and Greece. Meanwhile, work on the TANAP-TAP project to bring Azeri gas through an East-West line in Turkey to Greece, Albania and southern Italy continues. The targeted initial flow, scheduled for 2019, is 10 bcm but reportedly there are options for expansion at a later stage.

Marcel Kramer, an independent consultant, is the Regional Coordinator for Russia, the Black Sea and the Caspian.

Opening the Southern Gas Corridor

Enhancing Europe's Energy Supply

The Trans Adriatic Pipeline (TAP) supports the European Union's strategic goal of securing future gas supply. TAP offers a practical and realistic solution to the transportation of gas to Southern and Central Europe by opening up the Southern Gas Corridor.

The Trans Adriatic Pipeline will start in Greece, cross Albania and the Adriatic Sea and come ashore in Southern Italy, allowing gas to flow directly from the Caspian region to European markets.

The advantages of TAP for Europe include:

- Realistic and commercially viable
- Expandable gas transportation capacity (from 10 to 20 bcm per annum)
- Physical reverse flow of up to 80 per cent of capacity

For more information, please visit our website: www.tap-ag.com

Trans Adriatic Pipeline

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Global Pipeline Construction Plans

By GlobalData's Oil & Gas team, led by Matthew Jurecky

Planned capital expenditure on oil and gas pipelines around the world will exceed $500 billion by 2018, and North America and Russia will account for the lion's share according to a report by the research and consultancy group GlobalData.

The global oil and gas pipeline industry is expected to witness the start of the operation of 504 pipelines during the 2015-2018 period. Of these, 315 will be natural gas pipelines, 105 will be crude oil pipelines, 53 will be petroleum product pipelines, and 31 will be natural gas liquids (NGL) pipelines. Total associated capital expenditure (capex) is expected to be $539 billion (*see Figure 1*).

During the 2015-2018 period, 74 countries are expected to witness the construction of oil and gas pipelines, with a total length of 198,428km. The USA will lead this field, accounting for 19% of the global planned length, followed by Russia with 12% and Canada with 10%.

▼ Planned capital expenditure on pipelines will exceed $500 billion by 2018.

Gazprom will be the leading operator of these planned pipelines by 2018 with operatorship of a total length of 11,171km. Its major pipelines include Power of Siberia (Russia Section-I & II), Irkutsk-Krasnoyarsk-Proskokovo Gas, Southern Corridor Eastern & Western Route Gas and Murmansk-Volkhov. Gazprom will also be the leading company in terms of equity, with a stake in a total planned pipeline length of 16,595km.

Major gas pipeline projects

At 6,000km the longest proposed gas pipeline would link Iran, Iraq, Syria and Lebanon, allowing Iran to export natural gas from the South Pars gas field to new markets. Until there is a resolution to the Syrian civil war the main section will remain in the feasibility stage but the first section has been built. This runs from Charmaleh in Iran to the border town of Naft-Shahr and thence to the Al-Mansoureh power plant in Iraq. It is due to open in May and will initially will supply 2.5 bcm/year but this could increase to 14.6 bcm.

Next in length in terms of its trunk line is China's 5,220km third West-East gas pipeline (WEGP 3), although the eight branches add 2,158km. Due in service later this year, WEGP 3 will satisfy rising natural gas demand in western and eastern China. Fed by natural gas from Central Asia, it runs from the Horgos port in northwest Xinjiang on the border with Kazakhstan to the Fuzhou metering station in Fujian Province. A fourth WEGP is planned, while the Central Asia-China pipeline is being expanded with a fourth line.

The 4,128km Trans-Saharan gas pipeline would supply natural gas to the European

market from West Africa, helping to reduce Europe's dependence on Russian gas. The plan is to start in the Warri region in Nigeria, pass through Niger and connect with pipelines to Europe in Algeria. A feasibility study has concluded that the pipeline would be beneficial to the economic development of the participating countries.

With the long-awaited gas deal between China and Russia now signed, construction of the Power of Siberia project is underway. Russia Section-I is the first 3,200km phase connecting the Chayandinskoye gas field in Sakha Republic (Yakutia) and Vladivostok.

China and Russia have signed a framework agreement for a second gas deal and if this goes ahead the 2,600km Altai pipeline will be built to supply natural gas from western Siberia to consumption centres in north-west China.

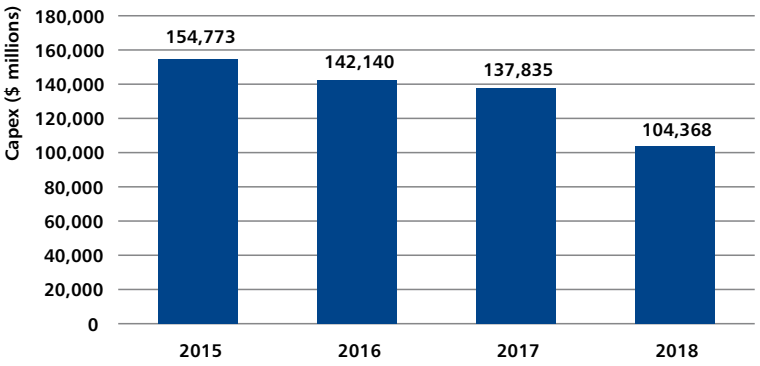
As Mozambique develops its gas industry a 2,100km pipeline has been proposed to supply gas from Cabo Delgado to Maputo Province, benefiting industrial, commercial and domestic consumers along the route.

The 1,950km Surat-Paradip pipeline would link Surat on the west coast of India, where there is an LNG import terminal, to Paradip on the east coast where one is proposed. It would help to meet increasing natural gas demand for both domestic and commercial use in the states of Gujarat, Maharashtra, Chhattisgarh and Odisha.

Connecting eastern India to the national gas grid is the aim of the Jagdishpur-Haldia pipeline project. This would supply the states of West Bengal, Bihar, Jharkhand and Uttar Pradesh using a 922km trunk line and 1,128km of feeders and spurs. Bihar would reap the most benefit, with 12 of its districts receiving piped gas.

The 1,841km Trans-Anatolian pipeline (TANAP) is being built in connection with Azerbaijan's Shah Deniz 2 project. Due onstream in 2019, this will supply gas to Turkey via an expansion of the South Caucasus pipeline (SCP) which will connect to TANAP. In turn, TANAP will connect with the new Trans Adriatic pipeline to supply Europe.

Global Oil and Gas Pipelines Capital Expenditure, 2015-2018



▲ Figure 1.

The White Stream project is intended to secure a second entry point to European energy markets for Caspian gas. The pipeline would branch off from the SCP at a location south-west of Borjomi in Georgia. From there it would run west to a new compressor station on the Georgian Black Sea coast and then beneath the Black Sea to Constanta in Romania.

After scrapping the South Stream project Gazprom is now promoting Turkish Stream to use some of the resources already committed. This pipeline would run from Anapa on the Russian Black Sea coast to make landfall near either Samsun or Istanbul. Negotiations are underway with Turkey.

Following the opening of the Los Ramones 1 pipeline in December 2014 to import US shale gas, Mexico's Pemex is now working on the 742km Los Ramones 2. This will link Los Ramones in Nuevo León state to Apaseo el Alto in Guanajuato state via Tamaulipas, San Luis Potosi and Queretaro.

Some of these projects will be presented by IGU's Working Committee 3 – Transmission in a thematic session during the 26th World Gas Conference in June.

For more information on GlobalData's oil and gas work visit www.globaldata.com.

Major Gas Pipeline Projects

Gas pipeline	*Length*	*Capacity (bcm/yr)*	*Start year*	*Capex ($ billion)*	*Status*	*Equity stakeholders*	*Operators*	*Contracts awarded*
Iran-Iraq-Syria-Lebanon	6,000km	40	2015 first section	10	Iran-Iraq section due to enter service, rest feasibility	Government of Lebanon, INOC, NIOC, Syrian Gas Company	NIOC/INOC/ Syria-Consortium	
West-East 3	5,220km trunk line + 2,158km branches	30	2015	20 (inclusive of the trunk line's eight branches, three gas storage sites and an LNG liquefaction plant)	Construction	PetroChina (52%), Baoshan Iron & Steel Co. (16%), National Social Security Fund (16%) and Urban Infrastructure Industry Fund (16%)	PetroChina	
Central Asia-China expansion (Line D)	1,000km	25 to bring total capacity to 85	2016	6.7	Construction			
Los Ramones 2 Norte	450km	15	2016	2.5 for both sections	Construction	TAG Pipelines (Pemex)	TAG Pipelines	Odebrecht, Arendal and Techint
Los Ramones 2 Sur	292km	15	2016		Construction	Pemex and GDF Suez	GDF Suez	ICA Fluor
Power of Siberia (Russia Section-I)	3,200km	61	2017	11.6	Construction	OAO Gazprom	OAO Gazprom	OAO Stroytransgaz won an EPC contract
South Caucasus expansion (SCPx)	487km of new pipeline + two new compressor stations	Will triple total SCP capacity to 20	2017	0.735	Construction	BP (28.8%), AzSCP (10%), SGC Midstream (6.7%), Statoil (15.5%), Lukoil (10%), NICO (10%) and TPAO (19%)	BP and Statoil	A joint venture between Saipem and Azfen
Trans-Anatolian (TANAP)	1,841km	16 initially	2018	12	Construction	SOCAR (58%), BOTAŞ (30%) and BP (12%)		Bechtel (FEED) Worley Parsons (EPC management)
Trans Adriatic (TAP)	870km	10 initially	2018	1.7	Implementation (construction to start 2016)	BP (20%), SOCAR (20%), Statoil (20%), Fluxys (19%), Enagás (16%) and Axpo (5%)		
Jagdishpur-Haldia	922km trunk line and 1,128km branches	11.5	2018	2	Feasibility	GAIL India	GAIL India	
Basra-Aqaba	1,680km	2.6	2018	18 including parallel oil pipeline with capacity of 1 mb/d	Feasibility			SNC-Lavalin will provide FEED; long-lead items tendering and evaluation; and EPC tendering and evaluation
Cabo Delgado-Maputo	2,100km	N/A	2018	4	Feasibility	Empresa Nacional de Hidrocarbonetos de Moçambique		Econex Pty was awarded a consultant contract to assist with the feasibility study and assess the project's socio-economic impact
Altai	2,600km	30	2020	10	FEED	China National Petroleum Corporation and OAO Gazprom	OAO Gazprom Transgaz Tomsk	
White Stream	Under evaluation	16	2022	2.5	Feasibility	White Stream Pipeline Company	White Stream Pipeline Company	
Trans-Saharan	4,128km	30	N/A	12	Feasibility	Nigerian National Corporation (45%), Petroleum Sonatrach (45%) and Republic of Niger (10%)	Trans-Saharan Natural Gas Consortium	

We are investing heavily in our future and it looks very bright indeed.

SOCAR, the State Oil Company of the Republic of Azerbaijan, is one of the world's largest companies in the energy industry. The company was founded in September 1992 on the basis of the industry structures operating during the former Soviet Union from the middle of the 20th century. The company's activities comprise the complete value chain from exploration of oil and gas fields, through production, processing, storage, transportation, to marketing and supply of oil and gas, petroleum and petrochemical products to domestic and international markets.

SOCAR has representative and trading offices in about 15 countries, including the United Kingdom, Switzerland, Singapore, Turkey and Germany.

Gas Industry

Proven natural gas reserves of Azerbaijan are estimated to be about 2.55 tcm. Annual production is about 29 bcm and it is expected to increase the export potential of Azerbaijan to a minimum of 40-50 bcm at 2025. Shah Deniz Stage 2 is a giant project that will add a further 16 bcm per year of gas production. Development of other Azerbaijan prospective structures Absheron, Umud, Nakhchivan, Babak and Shafaq-Asiman is planned in the near perspective.

The creation of productive economic synergies through expansion in international markets, implementation of investment plans and acquisition of new assets is the essential part of the strategic development of SOCAR.

Gas Markets & Strategy

Azerbaijan's gas strategy, based on the main principles of diversification, stability and security of supplies, has proved itself to be the right course in recent years. Currently Azeri gas is exported to Turkey, Russia, Georgia, and Greece. Azerbaijan supports Europe in achieving its strategic goal of securing further gas supplies and meeting growing energy needs. The Southern Gas Corridor will constitute one of the most complex gas value chains, offering substantial benefits for the range of countries from the Caspian Sea to the heart of Europe, consisting of multiple separate energy projects with a total investment of approximately $45 billion.

Today, Azerbaijan's main objective is to have the Southern Corridor established and operating as soon as possible which will contribute to the country's gas export potential for further development. Large transportation projects in the frame of the Southern Corridor, such as TANAP and TAP are currently under the process of realisation, and SOCAR is heavily involved in this task. TANAP carries significant political and economic value due to its potential to transport not only natural gas from the Shah Deniz field to European end markets, but also from other Azeri fields and potentially from other producing countries. TAP, which will connect to TANAP on the Turkish-Greek border, will be delivering to, and interconnecting, multiple markets in Western and Central Europe.

Way to the Southern Gas Corridor

After five years of negotiation with European Union and transit countries a Final Investment Decision was signed on 17 December, 2013 that included the expansion of the South Caucasian Pipeline in Azerbaijan and Georgia, the construction of TANAP across Turkey as well as TAP passing through Greece and Albania and ending in Italy. Natural gas from the Shah Deniz field will constitute the initial source for this corridor which will significantly reshape Europe's energy map.

The groundbreaking ceremony for the Southern Gas Corridor was held in Baku on 20 September, 2014 and attended by the leaders of Azerbaijan, Bulgaria, Turkey, Greece and Georgia along with senior officials from the US, Italy, the UK, Croatia, Albania and other European countries who all put their signatures on the first piece of pipeline. Additionally, on 12 February, 2015, the Ministerial Meeting of the Southern Gas Corridor Advisory Council was held in Baku and at the conclusion all the participants signed a joint statement for the press.

SOCAR as a foreign investor

SOCAR has gained significant market share in various countries by relying on its internationally successful experience in foreign activities. SOCAR is the leading investor in Turkey and Georgia. The company's investment portfolio for Turkey will reach around $20 billion through the implementation of TANAP, the development of the PETKIM Petrochemical Complex, the construction of the STAR refinery, a container terminal and a power plant. The STAR refinery project represents an investment of around $5 billion.

Internationally, SOCAR holds 100 natural gas distribution stations in Georgia and 170 filling stations in Switzerland.

The company has successfully reached an agreement for the acquisition of a 66% stake in Greece's natural gas transmission system operator DESFA. SOCAR President Rovnag Abdullayev stated that the company's decision to buy into DESFA proves the high level of bilateral relations between Azerbaijan and Greece and their leading energy companies.

WWW.SOCAR.AZ

IGU's Latest World LNG Report Set for Launch

By Mark Blacklock

IGU's World LNG Report – *2015 Edition marks an important year for the LNG business with 26mt of new liquefaction capacity expected to be commissioned – the biggest amount since 2009. Back then, three of Qatar's megatrains, Tangguh, Sakhalin 2 and the first train of Yemen LNG started up. This year sees the ramp-up of Australian production plus new projects in Indonesia, Malaysia and the USA. Apart from the volume of new capacity, 2015 is also noteworthy for the start-up of the first floating and tolling liquefaction projects.*

On the demand side although new countries continue to join the ranks of LNG importers, large chunks of capacity take some absorbing and there is likely to be continued pressure on spot prices. In 2014, the LNG trade's 50th year, production increased 2% to 246 mt but lower demand in Asia and the falling oil price led to a dramatic fall in Asian spot prices from the peak of $20/mmBtu.

The report has been prepared by Programme Committee D – LNG and will be launched during WGC 2015. For this year's edition the shipping section has been expanded and we have a special feature on LNG carriers on pages 186-192.

Australia accounts for 68% of this year's new capacity as it powers ahead to surpass Qatar by 2017 and become the top LNG producer. At the end of 2014, Australia inaugurated the world's

▼ Queensland Curtis LNG started loading its first cargo on December 28, 2014 on board the *Methane Rita Andrea*.

first LNG project using unconventional gas as feedstock when Train 1 (partners BG Group and CNOOC) of Queensland Curtis LNG started loading its first cargo. (It was delivered in January.) Later this year, Train 2 (partners BG Group and Tokyo Gas) will start up together with the first trains of Australia Pacific LNG (partners Origin Energy, ConocoPhillips and Sinopec) and Gladstone LNG (partners Santos, Petronas, Total and KOGAS). The three projects are supplied with coal-bed methane from onshore fields in the Surat and Bowen Basins, which is piped to liquefaction plants on Curtis Island in Queensland. All the plants use the ConocoPhillips optimised cascade process and when they are in full operation in 2016 they will have a combined capacity of 25.3 mtpa.

Australia's LNG production from conventional gas is also ramping up. The first train of Gorgon LNG, the world's most expensive LNG project costing $54 billion, is due to start up in mid-year. Gorgon's partners are Chevron, ExxonMobil, Shell, Osaka Gas, Tokyo Gas and Chubu Electric Power. The project involves piping gas from the offshore Gorgon and Jansz-lo fields to a plant on Barrow Island, Western Australia. Gas from the Gorgon field has a 14% CO_2 content which will be separated and injected into a formation beneath Barrow Island. When all three trains are in operation in 2016, Gorgon will have a capacity of 15.6 mtpa and be capturing up to 4 mtpa of CO_2.

Gorgon is using the Air Products propane pre-cooled mixed refrigerant (C3MR) process as is Donggi-Senoro LNG in Sulawesi, Indonesia. The start-up of Donggi-Senoro (partners Mitsubishi, Pertamina, KOGAS and Medco) was pushed back from 2014 and is now expected at mid-year. It has a capacity of 2 mtpa.

A second new Indonesian project is due to start up this year with an initial 0.5mtpa train. Energy World Corporation's Sengkang LNG is a modular project using Chart Energy's single mixed refrigerant (SMR) process.

▼ With three trains Gorgon LNG will have a capacity of 15.6 mtpa. A fourth train has been proposed.

▲ Petronas is set to commission the first FLNG project by the end of the year.

While the US began LNG exports back in 1969 from Alaska, Kenai LNG is a relatively small plant. At the end of this year, Train 1 of the first of the new wave of export projects drawing on the abundance of shale gas will start up. Cheniere LNG's Sabine Pass will operate on a tolling basis using the ConocoPhillips optimised cascade process. Train 1 has a capacity of 4.5 mtpa and another three will bring capacity to 18 mtpa in 2016. Two more trains are nearing FID.

Floating LNG accounts for 4.7% of 2015's new capacity, but is set to grow in importance due to its flexibility and the cost-effectiveness of building in a shipyard rather than in a remote location.

▼ Caribbean FLNG was built by Wison Offshore & Marine in its Nantong yard.

Petronas is set to commission the first FLNG project by the end of the year. Petronas FLNG Satu with a capacity of 1.2 mtpa will be stationed 180km off Bintulu, Sarawak to process gas from the Kanowit field. It will use the Air Products AP-NTM all nitrogen recycle process, and DSME and Technip have the engineering, procurement and construction contract.

Caribbean FLNG with a capacity of 0.5mtpa was set to be the first but has now been put on hold, although the barge-mounted facility has been built. This was going to be moored to a jetty off Tolú on Colombia's Caribbean coast to process gas brought by pipeline from the onshore La Creciente field operated by Pacific Stratus, a subsidiary of Pacific Rubiales. The process technology is Black & Veatch's Prico SMR technology and the barge is owned by Exmar, which will operate it on a tolling basis.

Regasification

Egypt, Jordan, Pakistan, Poland and Uruguay are joining the ranks of LNG importers this year, the Philippines will follow either in late 2015 or next year and several existing importers are expanding capacity.

At press time, Egyptian Natural Gas Holding Company (EGAS) was due to start imports using Höegh LNG's floating storage and regasification unit (FSRU) *Höegh Gallant*. The vessel is based at the Port of Ain Sokhna on the Gulf of Suez. Also due to start-up was Pakistan's first regasification facility at the Engro Vopak chemical and LPG terminal in Port Muhammad bin Qasim, Karachi.

Jordan's Ministry of Energy & Mineral Resources has contracted with Golar LNG for the FSRU *Golar Eskimo*. This will start operations at a new import terminal 18km south of Aqaba by mid-year as will Gaz-System's onshore terminal at Świnoujście in Poland.

Cheniere's LNG Network

CHENIERE

SPL Construction – October 2014

Sabine Pass Liquefaction

- ~1,000 acres in Cameron Parish, Louisiana
- 40 ft. ship channel; 3.7 miles from coast
- 2 berths and 4 dedicated tugs
- 5 LNG storage tanks, 160,000 m^3 each (~17 Bcfe total)
- 6 liquefaction trains*, ~27 mtpa total
- ConocoPhillips Optimized Cascade® Process

First LNG From SPL Expected 2015

Corpus Christi Liquefaction artist rendition

Corpus Christi Liquefaction

- ~1,000 acres owned or controlled by Cheniere
- 45 ft. deepwater channel, 13.7 miles from coast
- 2 protected berths
- 3 LNG storage tanks, 160,000 m^3 each (~10 Bcfe total)
- 3 liquefaction trains, ~13.5 mtpa total
- ConocoPhillips Optimized Cascade® Process

First LNG From CCL Expected 2018

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Singapore +65 6320 4900

Santiago +56 2 2487 3500

www.cheniere.com

** trains 1- 4 (18 mtpa) under construction*

WGC 2015 delegates will be able to tour Dunkerque LNG.

Egypt is joining the ranks of LNG importers by chartering the FSRU *Höegh Gallant*.

Uruguay's GNL del Plata terminal 4km offshore Montevideo will follow later in the year. Gas Sayago is working with GDF Suez and Marubeni on the project and operations will start using the *GDF Suez Neptune* operated by Höegh LNG.

In the Philippines, Energy World is building a regasification terminal on Pagbilao Grande Island, Quezon Province, while existing Asian importers are expanding capacity.

In Europe, delegates to WGC 2015 will have the opportunity of taking a technical tour of Dunkerque LNG, France's latest import terminal. This is set to open in November with a capacity of 10mtpa and is a joint project of EDF (65%), Fluxys (25%) and Total (10%).

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

Sempra LNG

Leadership · Commitment · Experience

Quick facts

- Sempra LNG developed one of the first liquefaction export facilities in the U.S., Cameron LNG in Louisiana
- We developed the first LNG receipt terminal on the west coast of North America, Energía Costa Azul in Baja California, Mexico
- Liquefaction projects in development: Cameron LNG expansion, Port Arthur LNG in Texas and a liquefaction project at Energia Costa Azul

Sempra LNG develops, builds and operates LNG receipt terminals and liquefaction facilities in North America and is active in the sale and purchase of LNG worldwide.

To learn more about Sempra LNG, our projects in development and exciting career opportunities, visit:

www.SempraLNG.com

Sempra® LNG

More Diversified LNG Carrier Fleet Takes Shape

By Mike Corkhill

As IGU's latest World LNG Report *points out, the past year has been one of the busiest ever for LNG carrier orders and deliveries. Today's orderbook is comprised of an increasingly wide range of vessel types and technologies.*

As of January 1 the in-service fleet of LNG carriers stood at 426 vessels, following the addition of 34 newbuilding deliveries to the total during the course of the previous 12 months. Of the completions in 2014, 30 were built at five shipyards in Korea while four were constructed by Mitsubishi Heavy Industries (MHI) in Japan.

All the ships constructed in Korea are powered by dual-fuel diesel-electric (DFDE) propulsion systems and provided with one or the other of the two membrane tank containment systems developed by Gaz Transport & Technigaz (GTT). In contrast the four ships delivered by MHI sport Moss spherical tank containment systems and are powered by steam turbines.

While the ships built in Korea in 2014 were all ordered by overseas ship owners, the MHI ships had been contracted by domestic shipping companies to serve Japanese utilities under long-term employment arrangements. Traditionally conservative, Japanese charterers have three decades of trouble-free experience of Moss spherical tank ships under their belts and continue to favour this robust containment system. The less efficient but more reliable and maintenance-friendly steam turbines have also remained the propulsion system of choice for most Japanese LNGC newbuildings.

MHI has introduced the Sayaendo class in recent years, a refinement in the design of its Moss tank ships. The Japanese word for "peas in a pod", Sayaendo features a continuous cover that is integrated with the ship's hull and encloses that part of the four spherical tanks that protrude above the main deck. Substituting for conventional hemispherical tank covers, Sayaendo provides weather protection for deck pipework and equipment and contributes to the structural strength of the vessel. It also enables savings in steel weight elsewhere in the hull and yields improvements in the ship's hydrodynamic performance through more optimised hull lines.

MHI has combined Sayaendo with its new ultra steam turbine (UST), a refinement of the established steam turbine propulsion system which utilises reheated steam to gain improvements in thermal efficiency. The shipbuilder claims that the combination of Sayaendo and UST results in a ship which achieves a 20% reduction in fuel consumption compared to a previous generation of Moss ship of the same size. MHI delivered the first two of the eight 155,000m^3 Sayaendo ships it had on order towards the end of 2014.

The total of 34 LNG carriers completed last year has only been bettered twice before, in

▼ Mitsubishi is pushing the boundaries of the Moss containment system technology with its Sayaendo continuous deck cover design.

2008 and 2009 when 52 and 42 such ships, respectively, were delivered. Of the 94 vessels commissioned during that two-year period, 37 were Q-flex ships of 216,000m^3 and Q-max ships of 266,000m^3 built to achieve economies of scale in the carriage of Qatari LNG to world markets.

Rethinking Q-flexes and Q-maxes

On charter to Qatargas and RasGas, the Q-flex and Q-max fleet totals 45 ships. Most of the vessels have now completed five years in service, and hence their first full class renewal survey and drydocking. The ships were designed and ordered when the price of oil was low, even lower than today, and that for gas comparatively high. As a result, when the newbuilding orders were placed, the charterers declared that each of the ships should be provided with a pair of conventional, oil-burning, low-speed diesel engines as well as a powerful reliquefaction plant to process all the cargo boil-off gas (BOG) and return it to the tanks as LNG. In this way the volume of cargo delivered to the customer can be optimised.

Virtually as the Q-flex and Q-max ships were being delivered, the oil and gas pricing positions were reversing, bringing into the question the wisdom of specifying oil-burning engines for the ships. Qatargas and RasGas have been reviewing their options and in early 2014 it was announced that *Rasheeda*, one of the 14-ship fleet of Q-max vessels, would have its twin, two-stroke MAN Diesel & Turbo engines converted to dual-fuel running in a two-month retrofit project to be carried out during its first five-year drydocking in spring 2015.

Rasheeda will be provided with a fuel gas supply system (FGSS) that enables gas to be safely injected at high pressure into the main engines. In their new guise the engines will be known as M-type, electronically controlled, gas-injection (ME-GI) units. The design of FGSS chosen to feed gas to *Rasheeda's* modified engines utilises high-pressure liquid, positive displacement pumps in tandem with a forcing vaporiser. This type of equipment means that the ship will need to draw off LNG from the cargo tanks and continue to process cargo BOG in its reliquefaction plant.

Rasheeda is set to be the first LNG carrier with a low-speed, dual-fuel ME-GI engine but it will be followed by a wave of newbuilding vessels.

▲ The engine tests at Hyundai in 2012, using LNG as fuel, represented a key stage in the evolution of the ME-GI engine.

The alternative FGSS design, of using gas compression, would have enabled *Rasheeda* to process cargo BOG for use in the engines. However, the size and weight of the required compressor, as well as its high power consumption, made it a non-viable option for the retrofit project.

The *Rasheeda* retrofit is a pilot project and Qatargas and RasGas will be assessing the performance of the vessel following its re-entry into service with dual-fuel engines. The charterers intend to convert the propulsion systems on further vessels in the Q-flex and Q-max fleet to dual-fuel running should it prove to be warranted. Although the price of oil has dropped dramatically over the past eight months, so has that for gas and the commercial incentives for a changeover remain.

The ME-GI surge

Irrespective of what happens with the existing fleet of Qatari ships, ME-GI engines have made great strides during the past year in the LNG carrier newbuilding market. Over the past decade the DFDE configuration has been the propulsion system of choice in the sector. The specification of four or five medium-speed engines per ship, each able to move seamlessly between the use of cargo BOG and oil fuel, to power electric motors has yielded significant efficiency and redundancy advantages over traditional steam turbines.

As of January 1, there were 97 DFDE-powered LNG carriers in service, while 114 of the 159 such ships on order were specified with this particular propulsion system. Behind the scenes, however, a new propulsion system revolution is taking shape. MAN has been working on the ME-GI dual-fuel version of its electronically controlled diesel engine for some time. As part of the technical qualification process which has yielded type approval for the gas-burning engine design, full-scale tests were carried with ME-GI engines by Hyundai in Korea in 2012 and Mitsui in Japan in 2013. Both are MAN licensees.

In December 2012 two pioneering sets of ship newbuildings were specified with ME-GI engines. Teekay opted for this propulsion arrangement for two 173,400m^3 LNG carriers it had ordered at DSME while TOTE similarly opted for ME-GI engines for a pair of LNG-powered container ships it is building at the NASSCO shipyard in San Diego.

The tally of ME-GI LNG carriers that Teekay has contracted at DSME has now risen to eight and the first of these is due for delivery in the first half of 2016. Furthermore, almost one-half of all new LNGCs ordered in 2014 were specified with ME-GI engines and as of January 1 there were 30 such vessels in the LNG carrier orderbook. In addition, in the early weeks of 2015 several LNGC newbuildings that had originally been contracted with DFDE propulsion systems were respecified with ME-GI engines.

ME-GI engines do pose technical challenges, not least the safety and mechanical issues associated with the supply of gas at high pressure to the cylinders. However these have been overcome through the use of FGSSs and double-wall piping. MAN points out that the use of its gas-injection engines can yield efficiency savings of 20% compared to a DFDE-powered ship of the same size. Furthermore, the capital cost of the ship is no greater and, if anything, the environmental performance in terms of atmospheric emissions is superior because there is no methane slip.

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Daewoo ascendancy

The Daewoo Shipbuilding & Marine Engineering (DSME) yard has been particularly successful as regards new ME-GI ship orders, with 26 of the 30 newbuildings of this type on its books. The shipbuilder has developed its own designs of FGSS and partial reliquefaction plant as well a cargo tank "sealing system" which enables the GTT No. 96 membrane tanks on its ships to accommodate the slow pressure build-up that occurs in the vapour space due to the generation of BOG. This configuration enables ships to sit at anchorage for up to 25 days without any loss of cargo. It also allows them to sail at 15 knots and return all the BOG to the tank, obviating the need for the ship to be fitted with a gas combustion unit (GCU).

DSME's success with ME-GI ships and its competitive pricing helped it gain 41 of the 68 orders for LNG carriers placed in 2014. The number of new ships booked last year equalled the record-breaking level set in 2004 and is an indication of how the LNG industry is preparing to meet the shipping needs of the new US export projects scheduled to come to fruition by 2020.

Four US liquefaction plants with a combined peak production capacity of 51 mtpa of LNG are now being built and purchase agreements for 41.4 mtpa of this output, at Henry Hub-linked prices, have now been finalised. Cheniere Energy is leading the charge with its Sabine Pass LNG project in Louisiana and has a two-year jump on its rivals. The inaugural commissioning cargo from this facility is expected in late 2015.

The cargo-carrying capacity of the conventional size LNG carriers now being specified is, most commonly, 174,000m^3. Up from 155,000m^3 and 160,000m^3 a few years ago, the new size is termed Pacificmax and is aimed at optimising economy of scale opportunities in the transport of US exports westbound across the Pacific to Asian customers. The capacity is limited by the need to negotiate the new enlarged Panama Canal locks which are set to be commissioned in spring 2016.

Onwards and upwards at DSME; the yard had its busiest ever year for new LNGC orders in 2014.

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Pioneering icebreakers

The current LNG carrier orderbook is not only the largest yet but also more diversified than ever before, reflecting the extent to which the gas shipping supply chain is being extended. The list of ships on order includes 15 icebreaking LNG carriers, the world's first three purpose-built LNG bunker vessels, an unprecedented number of coastal distribution tankers and the largest floating storage and regasification unit yet contracted.

The 15 icebreaking LNGCs, designated Arc 7 ice class ships, will be built by DSME for the transport of LNG from the Yamal terminal now under construction at Sabatta in the Russian Arctic. The Kara Sea port is icebound for nine months of the year as are the Arctic routes the ships will be taking.

Each of the 172,000m^3 Yamal LNG vessels will be provided with a DFDE propulsion system comprising six Wärtsilä 50DF medium-speed dual-fuel engines driving three azipod propulsors. The package will ensure a high degree of manoeuvrability and provide 45 MW of power, enough to propel the ship through 2.1m thick ice unassisted. Each icebreaking vessel will cost $315 million, about 50% as much again as a similar-sized conventional LNG carrier, and set new standards in LNG ship performance.

When operations commence in 2017, Yamal LNG will deliver cargoes eastbound on the Northern Sea Route to customers in Asia during the summer months, and westbound to Europe in the winter months. Some of the latter cargoes will be transshipped to conventional LNG carriers at the Fluxys terminal in the Belgian port of Zeebrugge, for onward shipment to gas buyers outside Europe.

Swelling small ship fleet

Over the past six months three LNG bunker vessels in the 5,100-6,500m^3 size range have been ordered, the world's first purpose-built ships of this type. The newbuildings will join a small, converted ship currently engaged in fuelling a cruise ferry in Stockholm harbour each day as the pioneers of a new type of ship-to-ship fuelling operation set to take hold globally in the years ahead.

The list of LNG ships now under construction also includes four coastal distribution vessels. All are earmarked for service along the China coast. Their delivery this year will boost the number of such LNG carriers worldwide to 20 and help spread LNG supply availability. The coastal tankers range in size from 1,100 to 30,000m^3 and all have IMO Type C tanks either cylindrical or bilobe in shape. These pressure vessel tanks do not require a secondary barrier and provide long holding times due to their ability to accommodate pressure build-up due to the generation of BOG.

Floaters to the fore

During the course of 2014 five new floating storage and regasification units (FSRUs) were delivered, boosting the in-service fleet of such vessels to 21. Six more are under construction and the FSRU orderbook is sure to be further replenished in the months ahead as the floating regasification vessel option is currently favoured by approximately one-half of the gas utilities seeking to establish a new LNG receiving facility.

The final piece in the floating LNG jigsaw is the floating production (FLNG) vessel. Five of these are under construction – with the first due in service by the end of 2015 – and two existing LNG carriers are being converted for an FLNG role. FLNG vessels will allow small, remote gas fields to be exploited in an expeditious and cost-effective manner. Such projects are gaining favour in the current investment climate where the volatility in energy prices is discouraging interest in large, capital-intensive, shore-based liquefaction plants.

Mike Corkhill is recently retired as the Editor of LNG World Shipping. *He continues to write extensively for the magazine as Contributing Editor.*

Höegh LNG – one of the world's leading LNG services providers

Höegh LNG was one of the world's first companies to enter into the LNG transportation market in the early 1970s, and has pioneered the development with cost effective and innovative solutions.

While Höegh LNG continues to operate sophisticated LNG carriers, the company has applied its expertise to develop world leading floating terminal solutions to meet the evolving demand for natural gas.

The shortcut to LNG imports

The traditional LNG receiving terminal was originally built onshore, which requires large tracts of land, high investment and takes a number of years to construct.

Since the first floating storage and regasification unit (FSRU) was delivered in 2005, these have been the preferred solution for many countries in order to implement a regasification terminal in as little as 6 months if the necessary infrastructure facilities are already in place, or about 18 months from FID for projects where a mooring solution and a pipeline need to be constructed. This compares to a land based terminal which often requires 4-5 years from FID.

New markets

FSRUs allow regasified LNG to reach new markets with short start-up times, low cost and flexibility. At the time of writing, 20 FSRUs have been built and approximately 30 additional FSRU projects have been identified.

After Höegh LNG's success in winning projects with energy major GDF Suez and for clients in Indonesia, Lithuania, Colombia and Egypt, the company continues to expand its fleet and recently ordered a new FSRU for delivery within Q1 2017 which will stack up as the company's seventh FSRU.

The latest fleet addition will enable yet another client to take the low cost and flexible shortcut to LNG imports.

It's Time to Become Involved in LNG 18

By Barbara Jinks

The 18th International Conference & Exhibition on Liquefied Natural Gas (LNG 18) – the leading industry forum for LNG professionals – will be held in Perth, Western Australia from April 11 to 15, 2016 at the Perth Convention & Exhibition Centre. Western Australia is where the vast majority of Australia's LNG is produced and is home to the largest concentration of oil and gas companies in the country. Amidst projections that Australia will become the largest exporter of LNG in the world within the decade, it is fitting and timely that LNG 18 will be held in Perth.

The LNG 18 conference programme theme – Redrawing the Global Map of Gas – represents the rapidly changing world of natural gas. During LNG 18, participants will have the opportunity to learn about, influence and make decisions for a better and more efficient LNG industry.

Dr Nirmal Chatterjee will once again chair the LNG 18 Programme Committee. With his wealth of experience in staging the LNG X

Key Dates

LNG 18 PERTH AUSTRALIA 11–15 April 2016

April 20, 2015	Deadline for submission of abstracts
June 16, 2015	Notification to authors
November 4, 2015	Deadline for early bird registration
January 18, 2016	Deadline for submission of final papers
April 11, 2016	LNG 18 opens

▼ The Perth Convention & Exhibition Centre, in the heart of Perth.

programmes for the last six events, LNG 18 will deliver an outstanding range of session topics. The National Organising Committee is working with the Programme Committee to complement the conference programme with keynote addresses by leaders of the industry.

"We, the 45-member Programme Committee representing 35 companies from 15 countries, are committed to developing a programme that will attract over 5,000 participants and 250 exhibitors to Perth, Australia. We plan to cover the entire LNG chain. To attract more regional and 'first time' delegates we will emphasise topics of special interest to the Asia-Pacific region as well as pioneering breakthroughs in new frontiers and new applications," says Dr Nirmal Chatterjee. The call for papers is now open until April 20, 2015 and information is available on the LNG 18 website www.lng18.org.

The LNG 18 exhibition will showcase more than 250 key players in the LNG industry from over 60 countries. The exhibition will be fully integrated with the conference to maximise delegate and trade visitor traffic on the exhibition floor. An innovative range of sponsorships have been created to maximise sponsor recognition and with LNG 18 by far the world's largest LNG conference it provides an effective way to further raise your company profile.

LNG 18 participants will be able to network during social functions as part of the LNG 18 programme. The Welcome Reception will take place at the State Reception Centre at Fraser's, located in the award winning Kings Park and Botanic Garden and offering breathtaking views over Perth's skyline. On the Thursday evening a dinner party will be held in the heart of Perth, offering a great networking opportunity.

Perth offers a wide range of exciting and unique venues for corporate events along the beautiful riverside and beaches. The technical programme includes tours to remarkable LNG facilities and sites. In addition, extensive media will be present and a unique programme will be on offer for accompanying persons. An exciting youth programme, in conjunction with the general LNG 18 programme, is also under development.

▲ Seen promoting LNG 18 at the 21st World Petroleum Congress are (*from left to right*): Rodney Cox (ETF), Kevin Skipworth CVO (Agent General for Western Australia, Government of Western Australia), Lucy Ladbrooke (Arinex Pty Ltd), Russell Stuart PSM (Government of Western Australia European Office).

Registration is now open and key dates to remember are the call for papers deadline on April 20, 2015 and early bird registration deadline on November 4, 2015. Group accommodation booking is already open so please contact the LNG 18 conference organisers on enquiries@lng18.org with your requirements.

The National Organising Committee looks forward to welcoming you to Perth in 2016.

Barbara Jinks is Executive Director of the LNG 18 National Organising Committee.

Contacts

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Arinex Pty Ltd
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LNG 18 Exhibition Organisers
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Gas: The ECA Fuel of Choice

By Mark Bell

▲ Mark Bell: economic case for gas is compelling.

Gas as a marine fuel is coming. For some it is already here and has been for a few years but for everyone else this is a new solution to a multitude of impending regulations, not least of which are those applying in the emission control areas (ECAs) established under the International Convention for the Prevention of Pollution from Ships (MARPOL). ECAs cover the Baltic Sea, North Sea, North American coastal area and US Caribbean Sea area.

Gas is not the only option for meeting current ECA regulations, which cap the maximum sulphur content of fuel oil at 0.1%. Ship operators can use low-sulphur fuel oil or fit exhaust scrubbers. But the economic case for gas is compelling for many operators and its use is gathering pace. A decade ago, apart from the LNG tanker fleet, you could count the number of gas-fuelled ships on one hand. Now there are that many projects appearing each month and we see the trend accelerating. Gas could well be the fuel of choice for operators whose ships spend large amounts of time within an ECA.

As the fleet of gas-fuelled vessels increases so does the number of fuel transactions and with methane in its liquid, cryogenic state, bunkering needs to be handled very carefully if we are to see the use of gas as a marine fuel continue to grow.

LNG is arguably the most effective way of transporting natural gas in bulk in all respects and LNG tankers have operated successfully for more than 50 years, often supplementing

▶ The fleet of gas-fuelled vessels is increasing. Delivered in 2014, Buksèr og Berging's *Bokn* and sistership *Borgøy* were the first LNG-fuelled tugs to enter service.

bunker fuel oil with boil-off from the gas cargo. The autonomous nature of any ship points toward the LNG solution as a bunker fuel for many ship types, especially when considering newbuilds.

SGMF – focus on safety, recommendations and best practices

Issues surrounding the use of gas as a marine fuel are distinctly different to those surrounding any other marine issue to date and the Society for Gas as a Marine Fuel (SGMF) has been set up as a membership-based industry organisation to address these matters and to help get the standards right from the start. Technology is known and currently being applied, safety is paramount throughout, environmental goals can be met and for everyone involved it can be argued that there are economic and commercial gains to be had.

It is likely that Asia will see the largest and fastest take-up of gas as a marine fuel, but there is a "dash for gas" across the globe from many sectors. In North America it seems that economics and attractive pricing are irresistible to shipping not to mention the fact that legislative deadlines are fast approaching. Indeed, more stringent controls on NO_x emissions will be introduced for newbuilds in ECAs in January 2016.

In Europe to date it has largely been subsidies that have kick-started the use of gas. For

▲ Fjord Line's passenger ferry *Bergensfjord* advertises its greener credentials.

◀ The first LNG-fuelled container ships are under construction for TOTE Shipholdings and Sea Star Line.

▲ The LNG hybrid barge (pictured on its delivery voyage to Hamburg) uses LNG to fuel electricity generators which provide power to the vessel's own electric engine and to cruise ships in their berths. This allows the ships to use an external, low-emission power supply rather than running their own generators in port.

example, Norwegian ferry operators are eligible for a subsidy of up to 80% of the cost for projects that reduce NO_x emissions, while the European Union is helping to finance LNG infrastructure for the Rhine-Main-Danube area.

During these times, not least until the international code of safety for gas-fuelled ships (IGF) has been agreed by the International Maritime Organisation (IMO), gas as a marine fuel is largely unregulated and in particular the bunkering of LNG itself needs to be addressed.

Already there have been incidents of large enough volume spillages to cause concern. Luckily so far these incidents have not resulted in serious injury or damage but we simply cannot wait for regulations. SGMF has already developed interim guidelines from industry best practice so that operators such as port authorities, bunker suppliers and end users can incorporate them into their own procedures and policy until such times as requirements become mandatory. These interim LNG bunkering guidelines are available to all members as a technical guidance document and will be revised when needed by the SGMF Technical Committee. For more information, please contact Klas Ljungmark, Principal Technical Advisor (klas.ljungmark@sgmf.info).

The SGMF Technical Committee also has a number of working groups looking at safe working distances, LNG quality, salvage of LNG in a marine environment and training and competence, to name but a few.

It seems ship operators are always going to have to comply with a never-ending stream of regulations; however, this time, with gas as a marine fuel, perhaps there is an opportunity to comply well into the future and gain economic benefits at the same time. See www.sgmf.info for public information and more details on membership and how to join.

Mark Bell is the General Manager of the Society for Gas as a Marine Fuel (www.sgmf.info).

IGF Code

IMO's Maritime Safety Committee approved the draft international code of safety for ships using gases or other low flashpoint fuels (the IGF code) in November 2014 with a view to adoption in June 2015. The basic philosophy of the IGF Code is to provide mandatory provisions for the arrangement, installation, control and monitoring of machinery, equipment and systems using low flashpoint fuels. It will apply to newbuilds and conversions of more than 500 gross tonnage, but could be applied to smaller ships on a voluntary basis, based on national legislation.

LNG 18

18th International Conference & Exhibition on Liquefied Natural Gas

Perth | Australia | 11–15 April 2016

Redrawing the Global Map of Gas

Images courtesy of Woodside and Tourism Western Australia.

Register online at www.lng18.org

You are invited to join the 18th International Conference & Exhibition on Liquefied Natural Gas (LNG 18) in Perth, capital of Australia's largest state Western Australia and the foundation of Australia's LNG industry.

Key facts and figures about LNG 18 are:

- **More than 5,000 participants from around the world are expected to attend**
- **Over 250 exhibitors from more than 60 countries will showcase their products and services**
- **Four day Conference program dealing with the entire LNG value chain**
- **Receptions, opening and closing ceremonies, technical tours, corporate events, accompanying persons' program**
- **Extensive national and international media presence before, during and after the event**

Papers can be submitted until 20 April 2015 and registrations open in March 2015. Visit the LNG 18 website at **www.lng18.org** to find out more about the event.

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Oil Price Volatility Clouds Future for GTL Projects

By Alex Forbes

The 60% fall in the price of crude oil that took place between June 2014 and January 2015 was bad news for prospective energy projects and not just those involving oil development. It was especially bad news for gas-to-liquids (GTL) projects – dependent as they are on the spread between natural gas and oil prices for their economic viability. If GTL is ever to become more than a niche industry, it will not now be until well into the 2020s.

The first half of the 2010s was an optimistic time for the still-nascent GTL industry. In 2011 Shell's huge Pearl project successfully came on stream in Qatar, more or less on time and – at a capital cost of $19 billion – within the budget range envisaged by Shell's board when it reached FID in 2006. Oil prices, after a period of relative stability at around $65-85/barrel during the latter years of the 2000s, climbed to over $100/b in early 2011 during the Arab Spring and remained within a relatively narrow band averaging $105/b until the middle of 2014. Meanwhile, gas prices in North America had been driven down to less than $4/MMBtu by the shale gas revolution.

For a technology that takes natural gas and converts it into oil products such as diesel, kerosene and naphtha, the divergence of gas and oil prices – regarded by many as a long-term structural shift – created what looked to be ideal conditions for new GTL projects. Not surprisingly, the focus for development shifted from the gas-short Middle East to the gas abundance of North America.

▼ Pearl in Ras Laffan Industrial City, Qatar is the world's largest GTL plant.

Both of the technology leaders in large-scale GTL – Shell and Sasol – announced plans for ambitious projects in the US state of Louisiana, with Sasol also pursuing a potential project in Canada. Meanwhile, developers of small-scale technology – in particular the two leading companies, CompactGTL and Velocys – said they were looking at a range of prospects for their technologies, both claimed to be ready for commercialisation, most of them in the US.

GTL's new wave

It seemed that the stage was set for a new wave of GTL project development, based largely on the gas abundance created in North America by the shale gas revolution.

Sasol announced in December 2012 that it had begun front-end engineering and design (FEED) on a world-scale ethane cracker and GTL complex at Westlake in Louisiana. The company said it expected to take FID on the ethane cracker in 2014 (which it did last October) and to have it up and running by 2017. Cost of the cracker part of the project was estimated at $5-7 billion. FID on the 96,000 b/d four-train GTL project was expected in 2016, when FEED was due to be completed. Estimated cost was $11-14 billion.

The plant would, said Sasol, produce diesel, naphtha, LPG, paraffin, base oils, and medium and hard waxes, with the first phase coming on stream in 2019, and the second phase in 2020 – making it the first large-scale GTL facility to be constructed in the US.

In 2013 Shell announced that it had selected a site for a potential GTL plant at Ascension Parish, near Sorrento, in Louisiana. For some time the industry had been waiting for Shell to make an announcement about what would come after Pearl GTL, with a project in the US looking the most likely option. Executive vice president Jorge Santos Silva said at the time that as part of an incentive package agreed with the state of Louisiana, Shell would spend a minimum of $12.5 billion on the plant, though he added that he expected project costs would be "well in excess" of that.

In other words, it appeared that Shell was planning a plant of similar scale to Pearl, which

▼ Table 1. Pearl reaped bumper profits thanks to $100/b+ oil prices in its early days but was planned to be profitable at lower prices.

Economics of Pearl GTL in Three Oil-Price Scenarios

	Low-case scenario	*Base-case scenario*	*High-case scenario*
Assumed oil price (US$/barrel)	40.0	55.0	70.0
Assumed gas price ($/MMBtu)*	0.00	0.00	0.00
Assumed upstream operating costs per boe of upstream production (US$/boe)	-1.0	-1.0	-1.0
Assumed downstream operating costs per boe of upstream production (US$/boe)	-5.0	-5.0	-5.0
Daily upstream wet gas production (kboe/day)	320	320	320
Assumed plant availability	95%	95%	95%

* Gas price is nominally zero for integrated projects. Its cost is covered by upstream capex and opex.

US$ million			
Capital cost of entire project	**-19,000**	**-19,000**	**-19,000**
Net Annual Income	3,024	4,421	5,818
Internal Rate of Return (IRR)	11.0%	15.3%	18.9%
Net Present Value (NPV) (US$ billion) @ 5%	15.1	29.6	44.1
Net Present Value (NPV) (US$ billion) @ 7.5%	6.7	16.7	26.7
Net Present Value (NPV) (US$ billion) @ 10%	1.5	8.7	15.8

has a production capacity of 140,000 b/d of GTL products from two 70,000 b/d trains and 120,000 b/d of upstream liquids, a total of 260,000 b/d. To put the plant's scale in context, gas supply to the project at full output is 45 mcm/d, which is roughly the amount of gas consumed by Poland during 2013.

In July 2014 came a moment that the GTL industry had long been waiting for when Velocys announced that FID had been taken on a plant for Waste Management's East Oak landfill site in Oklahoma, USA, the first-ever FID on a small-scale GTL project. "This small commercial GTL plant going ahead is a major psychological milestone, for the industry and for Velocys and its customers," said the company's CEO Roy Lipski. "After 15 years of development and over $300 million of investment . . . Velocys is now poised at the forefront of the distributed production revolution taking place in this new age of gas abundance."

Various other companies, some US-based and some foreign, had projects at various stages of development and – in a telling sign of growing interest in GTL – several new conferences were launched to serve the growing industry.

Oil price crash

Then came the oil price crash of 2014, which seemed to take most observers by surprise, coming as it did after more than three years of relatively stable prices. With the benefit of hindsight, however, the price plunge was not that surprising.

What was not obvious at the start of the shale gas revolution in North America was that the technologies that oil and gas producers had been employing to coax natural gas from shale rock – a combination of hydraulic fracturing ("fracking") and horizontal drilling – could also be used to extract oil. US oil production, in decline for decades, began rising strongly from about 2008, when light tight oil (LTO) production was negligible. By 2014, US oil output was more than 9 million b/d (Mb/d), up from 5 Mb/d in 2008, because of rising output of LTO, which totalled around 3.6 Mb/d in 2014.

According to the latest *Medium-Term Oil Market Report* from IEA, published in February 2015: "Total liquids production in the US is forecast to rise to almost 14 Mb/d in 2020, from 11.8 Mb/d in 2014, an average increase of about 360 kb/d per year. This level of liquids output sees the United States retain its top spot among non-OPEC producers and potentially continue to outpace Saudi Arabia in the medium-term."

Shell doubts

Even before the oil shock of 2014, Shell was having doubts about its proposed US project. In December 2013 the company stunned the GTL industry when it published the following statement: "Shell . . . has carefully evaluated a number of development options for GTL on the US Gulf Coast, using natural gas feedstocks. Despite the ample supplies of natural gas in the area, the company has taken the decision that GTL is not a viable option for Shell in North America at this time, due to the likely development cost of such a project, uncertainties on long-term oil and gas prices and differentials, and Shell's strict capital discipline."

Shell's then CEO Peter Voser commented: "We are making tough choices here, focusing our efforts and capital on the most attractive opportunities in our world-wide portfolio to add value for shareholders."

Further insights into why Shell walked away from the Louisiana project came in May 2014 when, at a conference in London, Guy de Kort, vice-president for GTL development, said: "The reason that we stopped the project was that we didn't see enough upside and too high risk in the project itself. That was really related to the uncertainty on labour costs and productivity. By no means does that mean that in Shell we've given up on GTL."

He also dispelled lingering doubts that the project had been pulled because of problems

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▲ Oltin Yo'l GTL will give Uzbekistan greater self-sufficiency in transportation fuels.

with Shell's GTL technology. Commenting on the company's existing GTL projects in Bintulu, Malaysia and Qatar, de Kort said they were "performing extremely well". Focusing on the Pearl project, which today accounts for a substantial percentage of Shell's hydrocarbons production and cash flow, de Kort said:

"The first train started in 2011 and at the end of 2012 we had both trains in operation. Everything has been proven and is running at or above design capacity. In 2013 we were running at 90% [utilisation]. We're now well above that. So we're very happy with the performance of Pearl."

Sasol slows Louisiana project and reduces stake in Uzbekistan

The industry faced another setback in January, when responding to the fall in oil price during the second half of 2014, Sasol said that it was reviewing its proposed project in Louisiana. In a statement the company said: "As a result of the ongoing capital investment reprioritisation exercise, Sasol has decided to delay the FID on its large-scale GTL plant in Louisiana. The timing of the decision will take into consideration progress made with the execution of the company's world-scale ethane cracker and derivatives complex, prevailing market conditions and other strategic investment opportunities."

CEO David Constable commented: "Albeit at a much slower pace, we will continue to progress the US GTL facility. This will allow us to evaluate the possibility of phasing in the project in the most pragmatic and effective manner. North America and our home base in Southern Africa remain strategic investment destinations for Sasol."

Sasol's decision means that North America will not have a large-scale GTL plant up and running by the end of this decade, after all – though it remains possible that several small-scale projects will reach fruition, depending on the view that their sponsors take on the long-term outlook for oil prices.

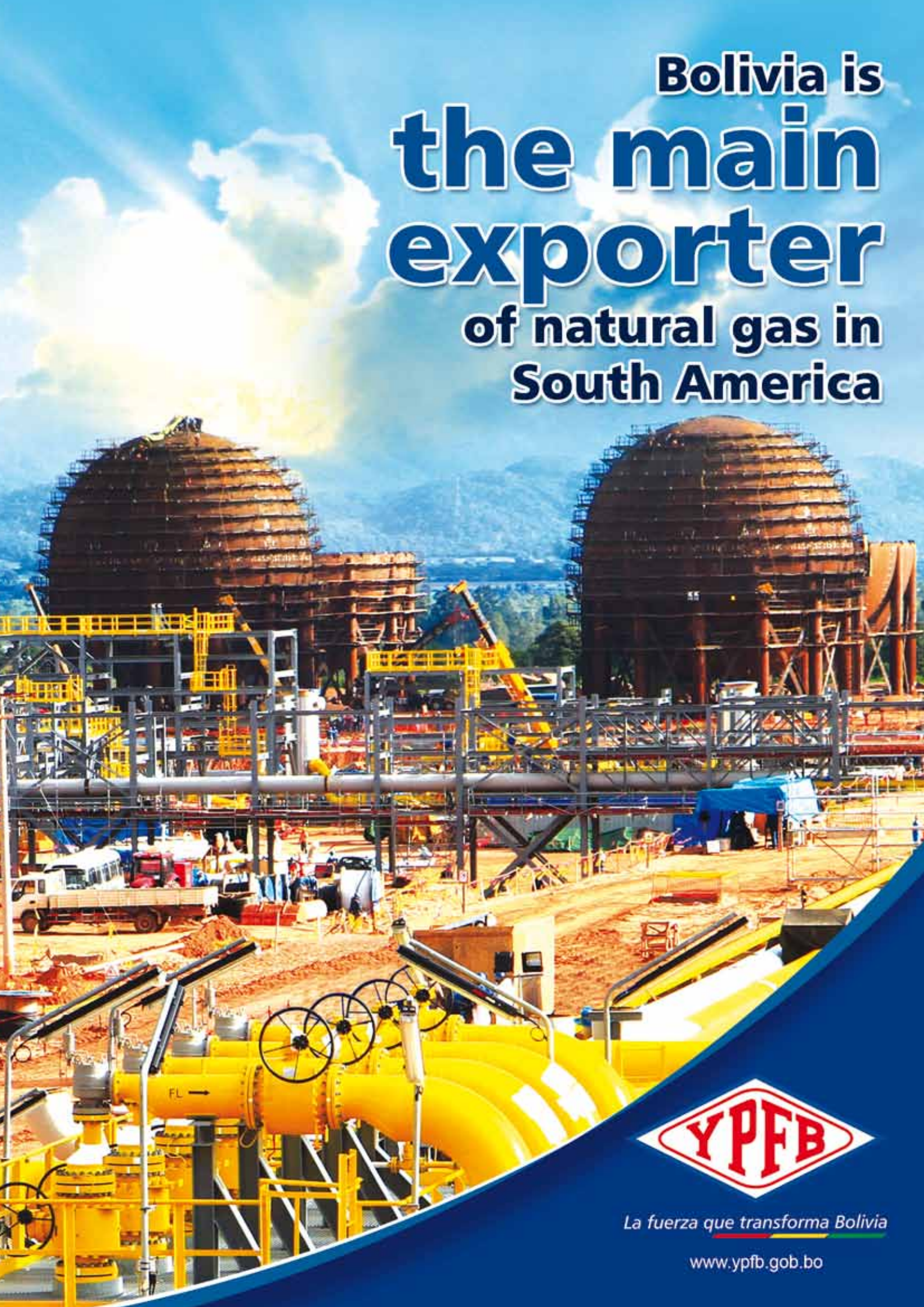
Indeed, it means that the only large-scale project that may start up this decade is Oltin Yo'l (Uzbek for Golden Road) in Uzbekistan. This is a joint venture involving Uzbekneftegaz (44.5%), Sasol (44.5%) and Petronas (11%). However, Sasol has said that FID is contingent on being able to reduce its stake by bringing in a new partner.

The 37,600 b/d project will use the slurry phase distillate technology developed by Sasol and utilised at the Oryx project in Qatar and the Escravos project in Nigeria. Oltin Yo'l GTL will produce diesel, kerosene, naphtha and LPG – with the kerosene for the jet fuel market. The transportation fuels will offset oil product imports. Feedstock gas will be supplied by Uzbekneftegaz under a long-term agreement with what are said to be commercially competitive prices. An Uzbekneftegaz subsidiary will lift the diesel and kerosene.

Escravos starts up – at last

One bright spot in what is otherwise mostly a gloomy outlook for GTL was the coming on stream of Escravos GTL in Nigeria during 2014, though that has been a troubled project – years late and massively over-budget.

FEED for the project – a joint venture of Chevron and the Nigerian National Petroleum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The feedstock for Escravos GTL (seen under construction) is gas that used to be flared.

Corporation (NNPC), with technology and finance support provided by Sasol – was completed in 2001. A $1.7 billion engineering, procurement and construction (EPC) contract was awarded in 2005 to Team JKS, a consortium of JGC, KBR and Snamprogetti. The project was originally due on stream in 2008/09. When it became clear that costs were escalating, the contractors asked to renegotiate terms. In 2007, KBR announced that Chevron Nigeria, Snamprogetti, and KBR's participating subsidiaries had agreed to amend the EPC contract from a fixed-price to a cost-reimbursable contract. By last year the project's cost had escalated to an astonishing $10 billion.

What makes the cost overrun so remarkable is that Escravos uses the same basic technology and has roughly the same design output capacity as the Oryx project in Qatar, a joint venture between Sasol and Qatar Petroleum. Yet Oryx cost around $1.2 billion, even allowing for remedial engineering work needed to fix initial teething troubles.

The difference is down to two main factors: timing and location. Oryx was built in the project-friendly environment of Qatar's Ras

Table 2. At low oil prices Escravos will produce an operating surplus but make little headway in recovering capex.

Project Economics: Escravos GTL

	Low-case scenario	*Base-case scenario*	*High-case scenario*
Assumed oil price (US$/barrel)	40.0	55.0	70.0
US$ million			
Capital cost of entire project	**-10,000**	**-10,000**	**-10,000**
Net Annual Income	252	433	613
Internal Rate of Return (IRR)	-3.3%	0.6%	3.6%
Net Present Value (NPV) (US$ billion) @ 5%	-6.4	-3.9	-1.4
Net Present Value (NPV) (US$ billion) @ 7.5%	-7.2	-5.2	-3.2
Net Present Value (NPV) (US$ billion) @ 10%	-7.7	-6.1	-4.4

Note: Assumptions were made about the gas price, operating costs, plant availability and plant efficiency as the actual data are confidential.

Laffan Industrial City. And the EPC contract was awarded before construction costs began the steep rise that occurred between 2004 and 2008. Escravos, by contrast, was built in a swamp in Nigeria and did not get under way until well into the cost-escalation period already mentioned. Human factors have also played a role, with local politics, militancy and piracy all having their effects.

Uncertain future

As it looks to the future, the GTL industry can congratulate itself for having solved the technology challenges involved in getting projects to work. The list of companies claiming to have GTL technology ready for commercialisation continues to lengthen. However, growing the industry's capacity beyond the current 250,000 b/d will require the launching of new projects.

Right now, with oil price in the doldrums it is hard to see new projects being proposed any time soon, even in Mozambique, which has attracted the interest of South Africa's PetroSA, Sasol, Shell and other GTL technology developers. Whatever happens, GTL will be behind LNG in the queue for access to gas reserves and even the LNG projects have many question marks hanging over them.

At Shell's 2014 financial results presentation at the end of January, CEO Ben van Beurden stressed the company was wary of over-reacting to the sudden low oil price environment. "Volatility is a fact of life in our industry," he said. "It is what it is, and we have to manage through it – and there are some important lessons from history. Short-term movements in oil prices can be driven by perception, and prices tend to over-react on both the upside and the downside. In the medium term, supply and demand fundamentals tend to re-assert themselves around the marginal cost of supply.

"We have not changed our long-term planning assumptions of $70-$90-$110 Brent. The long-term demand outlook remains robust, and industry under-investment today simply leads to more upside risk in oil prices in the future. However, we have to think carefully about the implications of today's prices, which are below our planning range, and we don't have much visibility on how long this downturn will last – months or years."

At the same time he announced that Shell was cutting its capital expenditure budget by $15 billion for 2015-2017, a lead that many other energy companies have since followed. Yet again, the GTL industry faces an uncertain future.

Alex Forbes is an independent journalist and consultant who has been reporting on energy developments and analysing trends for three decades. GTL is one of his specialities.

Qatar Airways has been trialling a 50:50 blend of GTL and conventional jet fuel.

ROSEN GROUP

Crack Detection and Characterisation in Gas Transmission Pipelines

Introduction

High pressure gas transmission pipelines are an important part of our infrastructure. A wide range of flaws, in particular cracking, can affect these pipelines, degrading their integrity and leading to reduced lifetimes, service ruptures or fatal errors. To ensure safe and economical operation periodic assessments of pipeline integrity are mandatory. In-line inspection (ILI) is accepted as the optimum approach for detecting and characterising flaws such as cracks, but also metal loss and other features.

All pipelines are designed, built and operated according to standards and codes that are intended to ensure safe and economical operations for long periods of time. However, defects do occur, and to prevent failure the pipeline condition must be periodically assessed. Continued operational pressure cycling or unintended pipe movement may initiate and grow cracks sufficiently to cause an operational failure.

ILI can report cracking at an early stage long before it is of structural significance to normal operations. Successive ILI inspections over time can reveal the growth rates of active cracks. Such early detection, together with calculations of growth rates, allows the pipeline operator to take prompt corrective actions to reduce or eliminate the threat. The resulting cost savings can be enormous.

Cracking

Cracking is one of the most serious threats to any pipeline's integrity, with particular risks involved for gas pipelines due to their generally higher potential for fatal consequences. Cracks can have a number of causes including:

Environment environmentally assisted flaws such as stress corrosion cracking (SCC),

◀ Figure 1: In-line inspection vehicle loaded to a truck for transportation.

Thermal and load stresses occasional loading and extreme thermal fluctuations, leading to axial pipeline stress and consequently to circumferential cracking,

Circumferential hoop stress the circumferential hoop stress is usually dominant in a pipeline, thus cracks that form tend to be axial in direction, e.g. SCC, axial fatigue cracks, cracks in the longitudinal seam weld.

Certain environmental conditions, as well as coating disbondment may increase the susceptibility for SCC.

The classical form of SCC, usually called high level pH SCC, was discovered in the mid-1960s in the USA. A form of intergranular cracking, classical SCC occurred in pipelines subject to relatively high stresses, elevated pH and temperatures, as well as depressed cathodic potentials. In the early 1980s a new type of SCC, usually called low level pH SCC and different from the classical form was discovered. In this new form, the cracking of the pipeline steel occurred in a transgranular fashion in a near-neutral pH environment and relatively low pipeline temperatures.

For transgranular SCC to occur three conditions which must be present concurrently:

- susceptible pipe material,
- tensile stress, and
- conductive environmental conditions at the pipe surface.

In-Line Inspection

Ultrasonic ILI technology represents the state-of-the-art solution for detecting and sizing cracks in operational pipelines. Conventional ultrasonic crack detection tools require a liquid medium to couple ultrasonic energy into the pipe wall, and so they are really suitable only for liquid pipelines. Gas pipelines are extremely difficult and expensive to inspect with conventional ultrasonic crack detection tools. Electromagnetic Acoustic Technology (EMAT), on the other hand, injects the energy electromagnetically to eliminate the need for a liquid couplant. EMAT-based tools are therefore suitable for both gas and liquid pipelines.

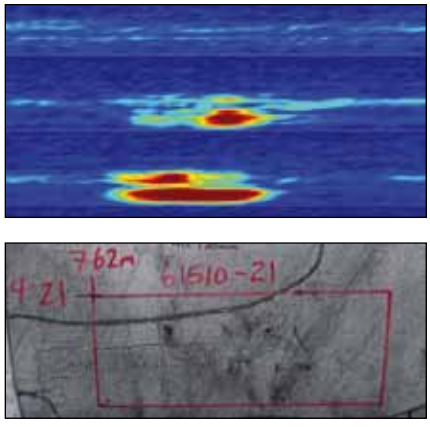
Highly specialised ILI tools have been developed by ROSEN to detect and measure pipeline SCC. Based on the EMAT principle these tools can make accurate measurements of SCC features, in addition to pinpointing any areas of coating disbondment that may facilitate future SCC initiation. A typical ROSEN EMAT tool is shown in figure 1.

The physical principle behind EMAT is the production of a guided ultrasonic wave through the combination of Lorentz force and magnetostriction. The wave then propagates through the pipe wall and is returned as an echo from any cracks that may be present.

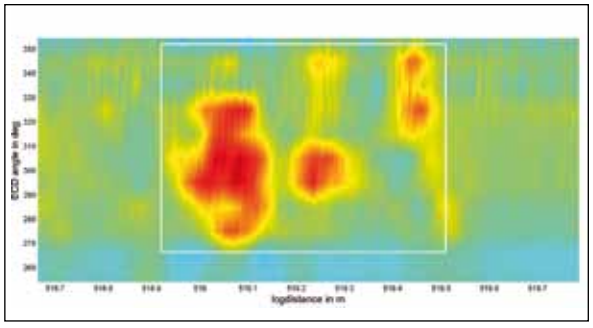
Typical data obtained from cracks and coating disbondment are shown in figures 2 and 3.

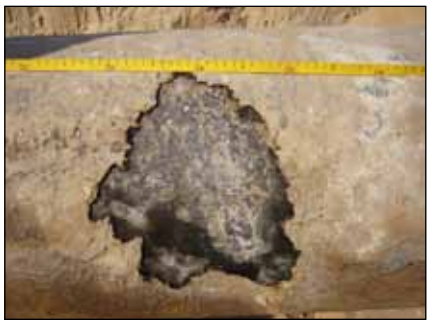
Today, a high quality EMAT ILI service is a substantial part of the Integrity Management program for a gas transmission pipeline. The sensitivity of the technology has been proven to identify even shallow cracking with a crack depth below 1mm.

For further information please visit our web-site: www.rosen-group.com



▲ Figure 2: Measurement of a stress corrosion cracking field. ***Above*** data representation of a SCC crack field; *Below* SCC field confirmed during pipeline repair.





▶ Figure 3: Measurement of coating disbondment on asphalt coated pipeline. *Above right* side data view of EMAT ILI data. *Below right*, coating disbondment confirmed in the field.

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Growing Momentum for CCS – Developments at Technology Centre Mongstad

By Eirik Harding Hansen

2015 is set to be a milestone year for climate change policy, and one that will solidify the role of carbon capture and storage (CCS) in the new energy economy. The 21st UN Climate Change Conference (COP 21) in Paris will see a new international climate change agreement adopted, with a view to implementation from 2020, and the UN has already highlighted CCS as a critical technology that will help form the basis of this COP 21 covenant.

Indeed, Christiana Figueres, Executive Secretary of the UN Framework Convention on Climate Change, recently stated "it is only with marketable CCS that we will be able to use the fossil fuels that we need", adding that CCS would be her top choice for investment alongside energy storage technology.

There is growing international momentum behind CCS and 2014 was arguably the most momentous year for the technology in some time. In November, Canada's Boundary Dam project (the world's first full-scale CCS power station) became operational, while in the USA, Kemper County, which is set to become the largest CCS power plant in the world when it starts up in 2016, neared the end of its construction phase.

The IPCC's landmark 5th Assessment Report was also launched in November, stating unequivocally that CCS and bio-CCS must be part of the energy mix if we are to limit global warming to 2°C. Furthermore, we saw calls for an EU-wide Emissions Performance Standard (EPS) intensify after the USA introduced emission limits on coal and gas power plants.

▼ TCM provides an important arena for testing, verification and demonstration of CCS technology.

Energy generators have been capturing and transporting CO_2 gases for decades to facilitate activities such as enhanced oil recovery and the production of carbonated drinks. But the fact remains that CCS technologies do not currently exist at commercial scale and carbon capture is costly; the Global CCS Institute estimates that each MWh supported by CCS costs energy generators an additional $50-$100, as well as substantial capital costs for development.

The major challenge facing the CCS industry is to adapt the technology so that power plants, refineries, cement plants and other industrial facilities can use it, at the right price. To achieve this, a chain of development from R&D, to demonstration, and then to full scale commercialisation is necessary. Technology Centre Mongstad (TCM) provides an important arena for testing, verification and demonstration of technology to take place. Indeed, technology testing is the vital route for verifying and demonstrating capture technology, which in turn can reduce costs, plus technical, environmental and financial risks, thereby creating the preconditions for CCS success. By bringing costs down and making the market viable, technologists provide a basis for global energy policy and investment.

To meet the need for testing, large-scale test centres have been developed to allow the safe simulation of carbon capture. Demonstration projects like TCM are vital in moving us towards the cost tipping point, where the price per kilowatt hour of CCS is investible, based on the payback of reducing the financial and social costs of carbon emissions.

TCM, a joint venture between the Norwegian state, Statoil, Shell and Sasol, is the most advanced of the world's test centres, offering the ability to capture 100,000 tonnes of CO_2 a year, from cracker flue gas, which resembles flue gas from coal-fired power plants, and gas-fired sources. Crucially, TCM is the only large-scale test centre providing gas-fired carbon emissions for testing and the possibility to test on two different flue gases, and as a result has played a major role in progressing the CCS market over the past year.

New test campaigns

Significantly, TCM in October 2014 completed the world's first open-source, large-scale CO_2 capture tests of amine solvent monoethanolamine (MEA) on flue gas from a gas-fired power plant, in collaboration with Aker Solutions as a part of its test period at the centre. Baseline solvent MEA is commonly used in post-combustion carbon capture studies to compare the performance of proprietarily-developed amines and other CO_2 removal processes, and the results prove that industrial-scale CO_2 capture is technically and environmentally feasible to an extent never seen before, setting a new benchmark for the CCS industry.

The MEA test campaign was designed to investigate the impacts of varying MEA concentrations, verify design capacity and flexibility of the plant and specific functionalities, and help understand scale-up, performance and emissions aspects. Around 150 different plant run scenarios were investigated and the campaign also tested different online and offline

▲ The new test campaigns are using the amine plant at TCM.

TCM shared some of the most important results of the MEA test campaign at GHGT-12.

techniques for emissions monitoring analysis.

The campaign at TCM has given the CCS industry significant new insight into the operations of large amine plants treating gas-turbine flue gases, and has proven that energy and electricity can be produced from natural gas with an extremely low CO_2 footprint and within emission limits set by the Norwegian environmental authorities. The results show energy demands for CO_2 removal can be reduced from previously anticipated 4.1 GJ/kg CO_2 removed to about 3.4 GJ/ton CO_2 removed, while capturing 90% of the CO_2 in the flue gas. This is a reduction in energy demand of about 20%, which will have a significant impact on reducing costs for full-scale CCS.

TCM shared some of the most important results openly with the global CCS community at the Greenhouse Gas Control Technologies (GHGT-12) conference in Austin, USA in October 2014 to increase knowledge and understanding of CO_2 capture technology and to accelerate the full-scale deployment of CCS.

The following month, Shell Cansolv's test campaign of its technology planned for Shell's Peterhead scheme in Scotland, was launched. The testing, which is taking place at TCM's amine test facility, is intended to confirm Shell Cansolv's processes and emission controls using exhaust gas from the combined heat and power plant at Mongstad. The test phase will reinforce the Shell Cansolv CO_2 capture technology, and validate its readiness for deployment at industrial-scale projects.

Run by Shell UK, the Peterhead project in Aberdeenshire is developing the world's first full-scale gas CCS demonstration project. As a result of this project, it is estimated that up to 10 million tonnes of CO_2 emissions could be captured and then stored in the depleted Goldeneye reservoir, 2km under the North Sea bed. The implications of a gas-fired full-scale CCS project are huge, since adding the technology to a power plant can reduce its CO_2 emissions by more than 90%.

The run-up to COP 21 is an exciting time for TCM and the CCS industry more broadly. TCM continues its dialogue with international vendors for further use of the amine facility and a potential plug-and-play setup at the available site, and is also in dialogue with the US Department of Energy regarding CCS collaboration and knowledge sharing.

Carbon capture and storage could be a critical de-carbonisation technology for power and industrial applications, and essential for addressing climate change. Indeed, the International Energy Agency has estimated that as much as one-fifth of total required carbon emissions reductions will come from CCS by 2050. Technology Centre Mongstad, as the world's largest facility for testing and improving CO_2 capture, is preparing the ground for these critical CCS initiatives and is playing a crucial role in paving the way for policy makers to build a viable CCS industry to address climate change.

Eirik Harding Hansen is the Acting Managing Director of Technology Centre Mongstad (www.tcmda.com).


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Diplomatic Symposium Gets Gas Message Across

By Anette Sørum Nordal

With a new climate change agreement set to be signed during COP 21 in Paris in December, advocacy for gas is becoming increasingly important. There are several ways to send out strong supportive messages, one of which is through discussions about the positive aspects of gas with local diplomatic representatives. This is a way of reaching out to key decision and policy makers of many countries via the reports diplomatic missions make to their national governments. Two diplomatic symposiums have been tried out in Norway and have proven to be successful.

As part of IGU's work to raise the voice of gas, the Secretariat organised a diplomatic symposium at Høvik, Oslo, on December 16, 2014. The objective was to inform representatives from countries around the world of the advantages of gas. A similar symposium was held in February 2013 (see *International Gas*, April-September 2013, pages 200-202) and the Secretariat wants to continue with this tradition. Under the theme "Trends and Perspectives of the Gas Industry", high-level representatives from the diplomatic missions in Oslo were invited to discuss the role of gas in the present and future energy mix, how to take full advantage of the potential of natural gas and why it is important to continue to invest in gas infrastructure.

The interest for gas themes proved to be high with more than two-thirds of the embassies in Oslo registering senior representatives and ambassadors. In total, 80 delegates participated in the symposium which was generously hosted by DNV GL,

▼ There was strong interest in the diplomatic symposium with 80 delegates participating.

IGU Associate Member, in their main offices at Høvik, Norway.

The symposium was opened by Mr Henrik O. Madsen, Group President & CEO of DNV GL. He welcomed delegates before handing over to Ms Costanza Jacacio, Senior Gas Expert from IEA, who presented IEA's recently published *World Energy Outlook 2014* with a focus on the prospects for the role of gas in the energy mix in the years to come. Ms Elisabeth Tørstad, CEO of DNV GL – Oil and Gas, spoke about pathways for sustainable gas, and her presentation was complemented by that of IGU's Honorary Secretary General, Mr Torstein Indrebø, on the role of gas in a changing energy landscape. Mr Vidar Christensen from the Norwegian Ministry of Petroleum and Energy presented the Norwegian Continental Shelf (NCS) as an example of a long-term source of gas, while Mr Martin Layfield, Global Gas Segment Director at DNV GL – Oil and Gas, talked about the dynamics of the LNG sector.

Messages

The key messages from the presentations were that gas has a central role to play in the future energy mix. Although global gas demand will slow down relative to earlier decades, it will still continue to grow. Gas will be the fastest-growing fuel in the years to come.

The world today demands available, affordable and clean energy, and speakers agreed that gas can meet these criteria if certain measures are taken. Gas is available and widely distributed, with reserves to cover more than 200 years' consumption based on today's levels. New LNG suppliers are emerging, making the market more flexible than before. Gas has become more affordable, as the shale gas revolution in the United States and changes in gas pricing mechanisms have made it more competitive relative to other fuels. Gas is also clean and an ideal partner for renewable energy, offering a sustainable long-term energy solution.

IGU Secretary General Pål Rasmussen makes a point to Henrik O. Madsen, Group President & CEO of DNV GL.

Gas can provide both security of supply and a sustainable energy future, but consistent policy signals are important to make this happen. Only then can we take full advantage of the potential of gas.

The symposium ended with a debate moderated by Ms Karen Sund, Partner of Sund Energy, discussing the effects energy policy has on the development of gas markets. While in Europe gas has partly been replaced by renewables and cheap coal in electricity production, gas has displaced coal in the USA, and is increasing its market share in Asia. Indeed, Asia has seen a need for a cleaner energy mix, especially in urban areas. With oil-indexed gas pricing for most of the gas volumes in the region, the decline in oil price will make gas more competitive.

Further growth in gas markets was also discussed. Asia, Africa and Latin America were highlighted as the regions that will see strong growth. With the global energy landscape changing, all indications say that the LNG sector will continue to expand with new exports from markets such as Australia, the USA and East Africa.

IGU members are strongly encouraged to hold similar symposiums in their own countries, and the Secretariat will gladly support in providing advice and suggestions if required. Let us work together towards a stronger message!

Anette Sørum Nordal is Administration Consultant in the Secretariat.

Presenting IGU's New Members

At the Council meeting in Berlin in October 2014, IGU welcomed eight new Charter Members and nine new Associate Members. Each has been invited to contribute a short profile.

Armenia

The Union of Gas Companies of Armenia (UGCA) was established in June 2014 by five local companies: Gazprom Armenia, Transgaz, Avtogaz, Armaviri Gazmash and AEG Service. These companies carry out the following activities in the gas sector of the Republic of Armenia: natural gas import, transmission, distribution, storage, compressed natural gas (CNG) sales and maintenance of CNG facilities, verification and calibration of household and industrial gas meters, maintenance and in-home service of gas equipment.

The main objectives of UGCA are:

- Protecting members' interests in relations with state authorities, public and international entities;
- Promoting the use of natural gas and advanced manufacturing technologies at local and international levels.

UGCA anticipates the following benefits from IGU membership:

- Gaining access to IGU's network and resources by being a member of a well-known and influential worldwide natural gas organisation;
- Attending forums, workshops and other IGU activities to be aware of trends in the industry and to discuss new developments with potential impact on the future of the industry.

Armenia's natural gas industry has a very high gasification rate (almost 96% of the country) and has developed the use of CNG as vehicle fuel. In a country with a territory of 29,000km^2 there are more than 385 CNG refuelling stations.

In this regard, as an IGU member UGCA can share with other members the Armenian experience in the development of transmission and distribution networks, as well as in the use of CNG as a vehicle fuel.

Bahrain

The National Oil and Gas Authority (NOGA) was established in September 2005. NOGA's role is to regulate, oversee and develop Bahrain's oil and gas sector and implement government policies with the aim of preserving the Kingdom's oil and natural gas resources and at finding out alternatives for the optimum development of such resources and for obtaining the highest return thereon.

The structure of the oil and gas sector in Bahrain comprises three levels namely, NOGA, nogaholding, and the subsidiary companies. Nogaholding is the business and investment arm of NOGA and steward of the Bahrain Government's investment in the subsidiary companies. The subsidiary companies are Bahrain Petroleum Company (Bapco), Bahrain National Gas Company (Banagas), Bahrain Natural Gas Expansion Company (BNGEC), Bahrain Aviation Fuel Company (Bafco), Bahrain Lube Base Oil Company (BLOC), Gulf Petrochemical Industries Company (GPIC), and Tatweer Petroleum, and Skaugen Gulf Petchem Carries (SGPC).

NOGA wishes to share its experiences with the IGU members on the development of Bahrain's gas industry, and to learn from the

members their experiences and get access to latest technologies as well as the regulatory development in the gas sector. NOGA also keen to participate and contribute to efforts toward the advancement of the energy efficiency and clean energy technologies related to gas industry. IGU provides valuable opportunities for networking with gas industry specialists, governmental policy makers, and gas business leaders worldwide and NOGA would like to benefits from these opportunities. In addition, NOGA may be interested in hosting one of the future IGU events.

Belarus

JSC Gazprom Transgaz Belarus is one of the largest enterprises of the Republic of Belarus. It ensures an uninterrupted gas supply to Belarusian consumers including distribution, transportation and storage activities, and acts as a reliable partner within the international gas transportation system, supplying natural gas to Poland, Ukraine, Lithuania and the Kaliningrad region of the Russian Federation.

The company's network comprises 7,870km of gas pipelines, three underground gas storage facilities, 13 compressor stations and 222 gas distribution stations. It employs 6,800 people.

Gazprom Transgaz Belarus also operates the Belarusian section of Gazprom's Yamal-Europe gas pipeline.

The company pays special attention to the promotion of CNG as a vehicle fuel at the state and public levels. It operates a network of 27 filling stations and several service points for NGVs.

Membership of IGU provides an important partnership for the company, a unique opportunity to be represented in the international gas market as an important player within a growing sector of the world economy.

A secure gas supply to European consumers is impossible without strong cooperation with the European partners. Being an IGU member gives access to a forum with the potential for development, updating knowledge and networking.

Bolivia

Yacimientos Petrolíferos Fiscales Bolivianos (YPFB Corporación) is the Plurinational State of Bolivia's public oil and gas company and has ownership and control of the hydrocarbon resources on its behalf. Its role is to guarantee the supply of oil and gas within the national territory, export the surplus for the generation of income to contribute to the national development plan, insure the rational exploitation of resources and the incorporation of new reserves, under an efficient and accountable administration.

YPFB has several subsidiaries, through which it performs its main activities along the hydrocarbon chain: exploration, drilling, development, production, refining, storage, transport and distribution (pipeline and virtual) and commercialisation.

In terms of key figures, from 2006-2013, YPFB's investments totalled $7.071 billion. In 2013, the operating income resulting from internal gas sales and export contracts to Brazil and Argentina reached $6.195 billion, and natural gas production reached a record 19.4 bcm.

The entry into the petrochemical industry was consolidated through the construction of an ammonia-urea plant, scheduled to start operations in 2015. Also, ethylene-polyethylene and propylene-polypropylene plants are scheduled to start construction in the short term. With these and other significant investments down the road, YPFB plans to invest more than $3.3 billion annually along the hydrocarbon chain for the period of 2015-2019.

YPFB's priorities for the future are to intensify the exploration and prospection activities to find new oil and gas reserves,

to continue promoting the industrialisation process and to diversify value-added exports.

YPFB considers that its participation in IGU's meetings, the networking opportunities and the access to its knowledge resources could contribute significantly to the improvement and strengthening of the Corporation and, thus, to its objective of developing a successful and sustainable Bolivian gas industry. By being an IGU member, YPFB recognises natural gas as an essential part of a sustainable energy future and a key factor for the integral development of nations.

Chile

The Natural Gas Distributors Association of Chile (AGN) is a private organisation that was formed in September 2002. The main objectives of AGN are to monitor the development of the natural gas industry in Chile, promote the use of this energy source, and represent the industry in the governmental and public arenas.

AGN is the main representative of the natural gas distribution sector in Chile. We actively work with a range of organisations, including government and regulatory authorities, trade organisations, the media and technical committees, promoting the use of this energy source.

The four companies that form the Association (Metrogas, GasValpo, GasSur and Gasco Magallanes) distribute gas to approximately 730,000 residential, commercial and industrial customers throughout the central and southern regions of Chile. It's important to note that the development of Chile's natural gas industry has been via private investment with no subsidies of any kind. The Chilean energy market is an open one, where natural gas has to compete with the formidable presence of substitute fuels.

Considering the latter, AGN is actively fostering the utilisation of natural gas in different fields in Chile (NGVs in public transportation, development of CHP, etc.). Being a member of IGU will allow us to increase our efforts in this area and facilitate the development of infrastructure in new zones.

For AGN, to be part of IGU will allow us to be aware of new industry trends and to participate in the technical committees that discuss current issues affecting the future of the industry.

Hungary

The new Charter Member for Hungary is Hungarian Gas Trade Ltd (MFGK). A subsidiary of Hungarian national energy holding MVM, MFGK is the largest natural gas trader in Hungary. With annual natural gas sales of 6.9 bcm, MFGK is the most significant partner of the Hungarian gas universal service providers in supplying household customers. It also plays an increasingly significant role in the liberalised natural gas market.

The Company is committed to the long-term, secure natural gas supply of Hungary, and satisfies the requirements of the country from different sources with its long-term supply contracts. MFGK's activity is in accordance with Hungary's environmental interests, boosts the long-term growth potential of the economy and promotes affordable consumer prices. The Company has plans and proposals in order to provide a sustainable gas supply in the future, which it intends to develop in cooperation with the affected parties.

MFGK appreciates IGU's goals and sees its new membership as a great opportunity for cooperation, networking and knowledge sharing within the industry. The Company is committed to promote natural gas as a clean and safe fuel which facilitates an environmentally more responsible, sustain-able global energy system. It also intends to actively participate in the industrial and professional forum provided by IGU and share its experience, views and best practices with other members.

Kuwait

Kuwait Petroleum Corporation (KPC) is fully owned by the State of Kuwait. It was established in

1980 as an umbrella organisation to manage the country's diversified oil interests. As a group, KPC is actively involved in every aspect of the oil and gas industry. It engages in activities that range from discovering new reservoirs to delivering clean and safe fuel for motor vehicles, aircraft, ships, agriculture and power stations. KPC also provides several base petrochemical products used in industrial manufacturing.

From its head office in Kuwait City, KPC strategically coordinates and supervises the various group subsidiaries: Kuwait Oil Company, Kuwait National Oil Company, Petrochemical Industry Company, Kuwait Oil Tanker Company, Kuwait Petroleum International, Kuwait Foreign Petroleum Exploration Company, Kuwait Aviation Fuel Company and Kuwait Gulf Oil Company. It finances their operations and oversees the marketing of crude oil, refined product and gas in international markets. The Corporation also provides significant support to Kuwait's Ministry of Oil in its activities with other member countries of OPEC.

In August 2009, KPC started the import of LNG as fuel for local power plants in Kuwait. Although LNG is currently being imported through temporary facilities, KPC will import growing quantities in the years to come as energy demand is expected to rise in Kuwait. To achieve this, KPC plans to establish a permanent LNG import facility that will be commissioned in 2021.

Kuwait realises the importance of joining IGU in order to be more in touch with gas/LNG markets worldwide and to establish a stronger relationship with key players in the gas market and support the use of gas in the energy mix of the country.

Yemen

Composed of a consortium of five international companies and two state-owned corporations, Yemen LNG is the only producer and exporter of liquefied natural gas in the Republic of Yemen. At an investment of about $5 billion, Yemen LNG represents the largest industrial investment made in Yemen to date.

The company started operational activities in 2009 with the first cargo leaving the Balhaf terminal on November 7 that year. Yemen LNG is the fourth largest producer of LNG in the Middle East and among the top 10 in the world with its LNG exports going to 16 destinations in the Americas, Europe and Asia.

Yemen LNG operates a 320-km feed gas pipeline, a two-train plant and the export terminal. The design capacity of the Yemen LNG plant is 6.7 mtpa. The LNG plant's availability, energy efficiency and safety performance rates are among the highest in the industry.

Yemen LNG aims to be a responsible company locally, nationally and internationally and is making significant efforts in terms of its social and environmental responsibilities. The company works towards creating value for all of its stakeholders, namely the relevant Yemeni authorities and the local communities, in the vicinity of its operations.

By becoming a Charter Member of IGU, Yemen LNG aspires to strengthen its presence in the global LNG arena, benefit from the knowledge sharing during IGU events and maintain its image as a reliable source of energy to the world.

Anadarko Petroleum Corporation

Anadarko Petroleum Corporation is the third-largest producer of natural gas in the onshore United States and is also currently advancing an LNG development onshore Mozambique. The Mozambique Gas Development Project represents an economic and transformational opportunity for the country, positioning it to become one of the world's leading LNG exporting countries. With membership of IGU, Anadarko joins an organisation whose mission aligns with the company's own – to safely

deliver energy resources vital to the world's health and welfare.

Anadarko's mission is to deliver a competitive and sustainable rate of return to shareholders by exploring for, acquiring and developing oil and natural gas resources vital to the world's health and welfare. As of year-end 2014, the company had approximately 2.86 billion barrels-equivalent of proved reserves, making it one of the world's largest independent exploration and production companies.

Bureau Veritas

Created in 1828, Bureau Veritas is a global leader in testing, inspection and certification (TIC), delivering high quality services to help clients meet the growing challenges of quality, safety, environmental protection and social responsibility. Employing 61,600 people in 140 countries, Bureau Veritas is listed on the Euronext Paris stock exchange and reported revenues of €3.9 billion in 2013.

There are eight business units: marine and offshore; industry, which includes the oil and gas sector; in-service inspection and verification; construction; certification; commodities; consumer products; and government services and international trade.

As a trusted partner, Bureau Veritas offers innovative solutions that go beyond simple compliance with regulations and standards, reducing risk, improving performance and promoting sustainable development. Our core values include integrity and ethics, impartial counsel and validation, customer focus and safety at work. Bureau Veritas is recognised and accredited by major national and international organisations.

Bureau Veritas is delighted to become a member of IGU as we see the Union as playing an important role in the development of innovative solutions for the gas sector where we are very active. We see gas as a key element for the development of countries and populations and a second-to-none lever for an improved environment. Bureau Veritas has created and will continue inventing processes and standards in support of the use of gas; being a member will encourage our engineers and specialists to redouble their efforts.

China LNG Association

China LNG Association was registered in May 2011 under Ministry of Civil Affairs of the People's Republic of China. It is a national non-profit professional organisation representing the Chinese LNG industry.

After three years of development, China LNG Association has established a great reputation within the industry. So far, there are 191 members, covering China's whole LNG value chain.

Specifically, it has members of petroleum companies from CNPC, Sinopec, CNOOC; energy companies such as Henan Green Energy Holding Group Co., Ltd, Xinjiang Guanghui Industry Investment Group Co., Ltd., Shanxi Energy Coal Bed Methane Investment Holdings Ltd., and Yantai Jereh Oilfield Services Group; engineering companies such as Xindi Energy Engineering Technology, Gas Design Institute of Shaanxi; China Huanqiu Contracting & Engineering Corporation, Southwest Branch of CNPC Engineering Design.

In addition, well-known international companies such as Shell, Linde, Technip, APCI, Hitachi and TMEIC have joined as well.

Facing the world and covering the whole LNG industry chain, China LNG Association offers a full media service platform for member companies, including policies and regulations, global cooperation, cross-border exchanges, technical support, financial investments, human resources, industry training, and legal services.

In the meantime, China LNG Association will host an annual event called China LNG Expo in Shanghai. The first event will be held on March 17-20, not only to welcome LNG 19 which will

be held in China for the first time in 2019, but also to connect China's LNG industry to the world with better understanding.

Eni

Eni is one of the largest integrated energy companies in the world, operating in the sectors of oil and gas exploration & production, international gas transportation and marketing, power generation, refining and marketing, chemicals and oilfield services.

Eni is active in 85 countries with 82,300 employees. Our commitment to sustainable development means that we grow and retain our people, contribute to the development and wellbeing of the communities in which we operate, protect the environment, and invest in technological innovation and energy efficiency, mitigating the risks of climate change.

Eni has been involved in IGU activities in recent years through the Charter Member for Italy, CIG, and is keen to continue learning from the various global experiences of IGU with regards to technology and regulatory developments in the gas sector. Eni will actively participate in the different gas conferences and extensively cooperate with IGU members.

Indonesian Gas Society

The Indonesian Gas Society (IGS) is a non-profit organisation tasked with supporting the development of the gas industry in Indonesia for the benefit of society. IGS looks at commercial, technical, operational, human capability and HSE issues throughout the gas value chain.

IGS is an independent, effective and reliable organisation of energy professionals working to facilitate a close and effectual collaboration among stakeholders towards developing the Indonesian gas industry. It adopts sound policies, including a strategy to improve human resources capability, advanced technologies and a commercial structure.

IGS will actively contribute to the development of the global gas industry through its membership of IGU.

KOGAS

Korea Gas Corporation (KOGAS), a state-run company established in 1983, is a vertically-integrated enterprise covering projects throughout the LNG value chain, from upstream to downstream.

KOGAS was able to learn a lot about the global gas and LNG businesses from the international energy community through the Korea Gas Union's Charter membership of IGU. Thanks to the assistance and support of the International Gas Union, KOGAS is now supplying natural gas to about 80% of the total number of households in the country through its 4,108km-long nationwide pipeline network and 63 storage tanks in the company's four world-class LNG receiving terminals.

Over three decades, KOGAS has not only become the largest corporate LNG buyer, but also operates the biggest LNG receiving terminal in the world. In addition, KOGAS has expanded its business portfolio with 26 overseas E&P activities in 16 countries to further Korea's economic development, which is underpinned by the stable supply of clean and safe energy. This was made possible through the help of the international gas community.

In return, KOGAS is willing to contribute and commit itself to international cooperation. As an Associate Member of IGU, KOGAS will do its best to share its gas-related knowledge and expertise in pursuit of the world's energy welfare for a sustainable future.

Mongolian Energy Economics Institute

The Mongolian Energy Economics Institute (MEEI) was founded in 1959 to provide technical and research support to Mongolia's mining and energy sectors. MEEI has made a major contribution to the country's develop-

ment including, in cooperation with an international consulting company, the development of a master plan for energy innovation up to 2020.

MEEI has a key role in the development of the government's energy policy. The Institute has developed policies on long- and short-term power plans, carried out evaluation and analysis, designed equipment, performed feasibility studies on the development of new sources of energy, participated in development projects involving domestic and foreign investors, and developed norms and industry standards.

MEEI's Academic Council comprises 12 scientists with doctorates working on the development of science-based policy in the energy sector. Two departments are responsible for implementing the Institute's work programmes.

The Academic and Research Department is responsible for the norms and standards document processing sector, energy efficiency, the innovation and research sector, the renewable energy and clean technology sector, energy economic research and feasibility studies.

The Project Design Department is divided into the power project design unit, thermal project design unit and construction design unit. All are specialised in their own fields and employ well-respected experts.

Mongolia is a developing country with rich resources and a fast-growing economy. Now the gas sector is being developed and MEEI has joined IGU to exchange information and receive the latest news about technological and regulatory developments in the gas sector in different parts of the world through participation in the IGU committees.

MEEI's foreign partner organisations include KEEI, KEPCO, China Engineering Research Institute, SibEnergoGroup, Hyundai Heavy Industries, the Institute of Energy Economics Japan, KGS, Asia Holdings and Meritz Securities.

PT Pertamina (Persero)

Established in 1957, PT Pertamina is a state-owned energy company operating on commercial principles. Its activities cover the oil, gas, power and renewable energy sectors. Pertamina seeks to enhance its gas business by developing reliable gas infrastructure, operational excellence and value chain expansion to maximise upstream and downstream opportunities and create added value for stakeholders. Pertamina is willing to actively contribute in IGU through support of conferences and participation in technical committees.

Santos Ltd

An Australian energy pioneer since 1954, Santos is a leading oil and gas producer, supplying Australian and Asian customers.

With its origins in the Cooper Basin, Santos is one of Australia's largest producers of gas for the domestic market and has the largest exploration and production acreage position in Australia of any company.

Santos has also developed major oil and liquids businesses in Australia and operates in all mainland Australian states and the Northern Territory.

Santos also has an exploration-led Asian portfolio, with a focus on three core countries: Indonesia, Vietnam and Papua New Guinea.

From this base, Santos is pursuing a transformational LNG strategy with interests in three LNG projects: Darwin LNG, PNG LNG and GLNG.

Our substantial pipeline of projects ensures Santos is well positioned to achieve our production goal of 80 to 90 million barrels of oil equivalent by 2020.

With over 3,000 employees across Australia and Asia, Santos's foundations are based on safe, sustainable operations and working in partnership with host communities, governments, business partners and shareholders.

Publications 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 2013
- IGU General Brochure (revised)
- Triennial Work Programme 2012-2015
- 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 – 2014 edition
- Wholesale Gas Price Survey – 2014 Edition, A Global Review of Price Formation Mechanisms 2005-2013
- 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

IGU Events and Other Major Gas-related Events 2015

June 1
IGU Council Meeting
Paris, France

June 1-5
26th World Gas Conference
Paris, France

October 5-9
IPLOCA 49th Annual Convention
Singapore

October 20-23
IGU Council Meeting
Cartagena de Indias, Colombia

October 27-30
Gastech Conference & Exhibition
Singapore

November 25-26
European Gas Technology Conference (EGATEC 2015)
Vienna, Austria

November 30-December 11
21st Session of the Conference of the Parties to the UNFCCC (COP 21)
Paris, France

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Cover: BG Group (upper left: Methane Rita Andrea about to depart Queensland Curtis LNG with the first cargo, lower right: onboard the Bredford Dolphin drilling rig); Gazprom (a gas treatment unit at the Zapolyarnoye field in Russia); Tommie Hansen [CC BY 2.0] (panorama of Paris).

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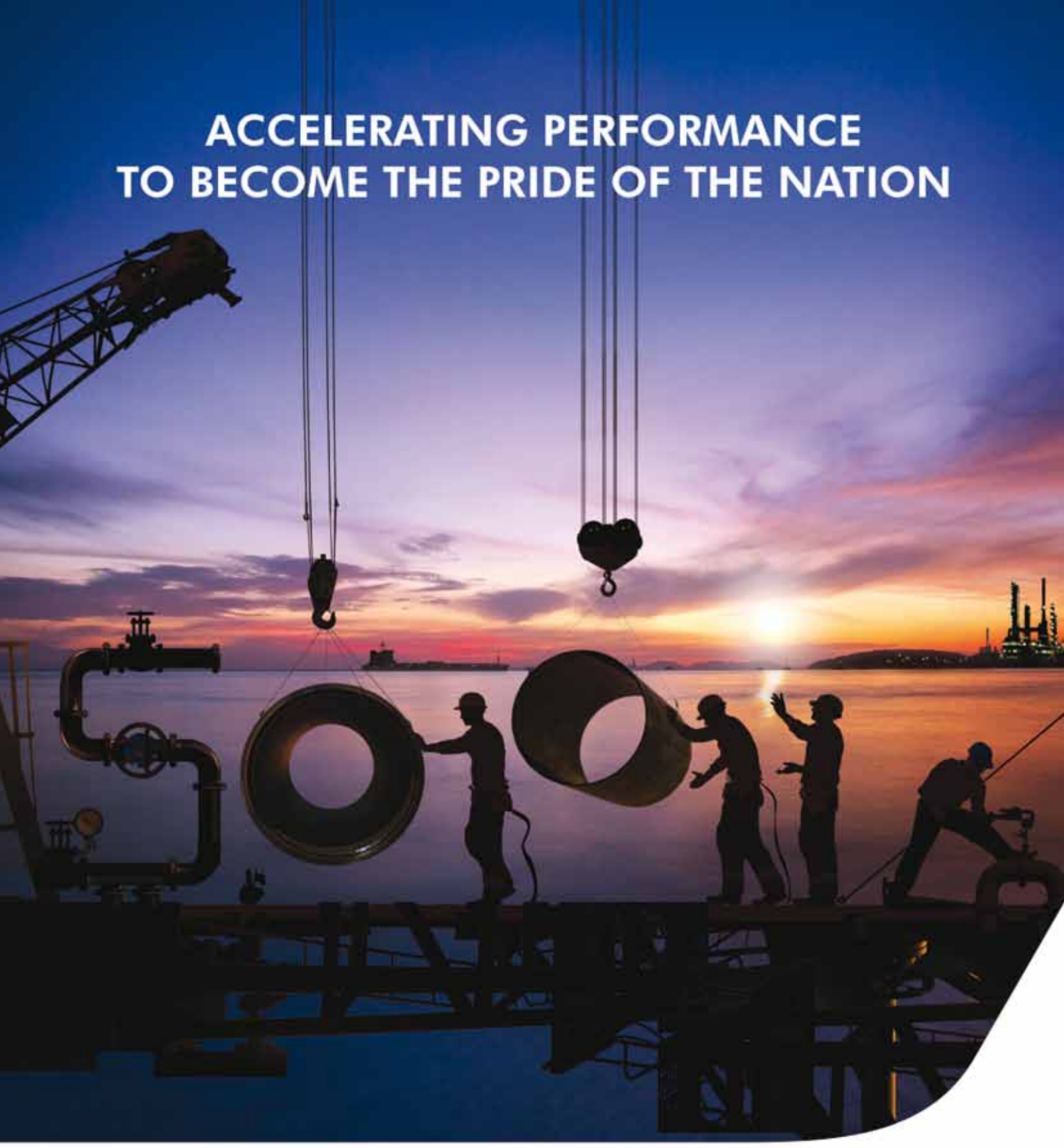

With a vision to be a world-class energy company, we continuously improve our performance by increasing production of oil and gas, as well as renewable energy. It is why we received international recognition as one of the Fortune Global 500 companies.

Bringing Indonesia to the world stage is our pride.

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