Celebrating Service
The 85th Anniversary of IGU and the transition of the Secretariat
Pushing the boundaries of technology. Changing the landscape of the LNG industry.

The PFLNG SATU. A first of its kind.

Today, a new era begins. One that will change the oil and gas industry forever. As we pioneer the technology to process natural gas hundreds of kilometres away at sea, we will soon be able to tap into the stranded gas fields once considered uneconomical to explore.

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COMMITTED TO NATURAL GAS

Investing substantially in the cleanest fossil fuel to reduce the carbon footprint
Vision and Mission

The International Gas Union (IGU) is a worldwide, non-profit organization 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 gas industry.

The IGU Vision and Mission were recently redefined to reflect changes in the global gas markets and the growth of the organization in recent years. The new Vision and Mission – approved at the IGU Council meeting in Paris, France, June 1, 2015 – reflect IGU’s Building for the Future outreach initiative and aim at making IGU a more proactive, focused and effective advocate for the global gas industry. With the changes, focus is moved towards IGU as the Global Voice of Gas and emphasis put on the fact that natural gas is a key contributor to people’s lives and futures.

Vision
As the global voice of gas, IGU seeks to improve the quality of life by advancing gas as a key contributor to a sustainable energy future.

Mission
- IGU is the key and credible advocate of political, technical and economic progress of the global gas industry, directly and through its members and in collaboration with other multilateral organizations.
- IGU works to improve the competitiveness of gas in the world energy markets by promoting transparency, public acceptance efforts and the removal of supply and market access barriers.
- IGU seeks to collaborate with governmental agencies and multilateral organizations to demonstrate the economic, social and environmental benefits of gas in the global energy mix.
- IGU supports and facilitates the development of new technologies and best practices, while emphasizing sound environmental performance, safety, reliability and efficiency across the entire value chain.
- IGU maximizes the value of its services to members and other stakeholders.
Offering innovative LNG liquefaction technology

ConocoPhillips began using its Optimized Cascade® process in 1969 and has since licensed this proven and reliable LNG liquefaction technology for 24 LNG trains around the world. From plant design to startup, our technology and expertise continue to deliver the highest standard of LNG facility performance to our clients and to us.

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To learn more, visit lnglicensing.conocophillips.com.
Schlumberger strives to provide value to customers and communities by lowering the environmental impact of our services globally. As a global technology leader, our technologies are directly and indirectly helping customers improve their operational efficiency, reduce emissions, decrease water usage, apply safer chemistry, and increase oil and gas production using fewer resources.

Schlumberger and its approximately 100,000 employees are dedicated to making an environmentally sustainable difference in the communities in which we live and work.

slb.com/globalstewardship
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**October 2016 – March 2017**

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THE WORLD

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Message from the President and the Secretary General

Dear IGU colleagues

With this edition of the IGU magazine we say goodbye to one IGU Secretariat team and welcome a new one! On 1 November 2016, Spain, through Gas Natural Fenosa, takes over responsibility as host of the IGU Secretariat. The nine years of the Norwegian Secretariat, graciously supported by Statoil ASA, has come to an end. By providing office facilities, personnel and back office services over nine years, Statoil ASA has made a tremendous contribution to IGU. Our organisation is stronger as a result and forever grateful to Statoil for its historic sponsorship.

Since 2007, when the Secretariat moved to Oslo, the global gas industry has witnessed major changes and corresponding challenges. IGU, in turn, has responded, building for the future to ensure our continued relevance in the marketplace and enhancing the value to our members. Together with four Presidencies, the Norwegian Secretariat pursued several developmental initiatives. Considerable progress has been made, and our work continues.

Luis Bertrán Rafecas, as incoming Secretary General, and his new team in Barcelona will endeavour to build on the contributions of their Norwegian predecessors. The Spanish team has been confirmed and will be presented to the Council in Amsterdam. As the Oslo team say goodbye, we look back with pride on their record of service to IGU and look forward to a bright future for the organisation.

Over the last six months, much of our focus has been placed on the G20. In June one of our main deliverables for 2016 took place: the G20 Natural Gas Day. The event was co-hosted by IGU and the Chinese National Energy Administration and included a full day of workshop presentations and debates which brought together G20 Energy Ministers, policymakers, CEOs and other gas industry representatives to discuss the potential of gas. Beijing Gas Group, an IGU Premium Associate Member, led by Chairperson Li Yalan, provided exceptional leadership and support in this effort.

The gas day event was referenced by the G20 Energy Ministers meeting held the following day and conveyed the compelling message of how gas can help clean up dirty urban air. A G20 Natural Gas Day Statement was reported to the Ministerial meeting by the IGU President.
As a result, natural gas was included in the official communiqué issued from the G20 Energy Ministers meeting with language that included: “We note the results of the G20 Natural Gas Day. We recognise that natural gas can be a less emission intensive fossil fuel, and can play an important and effective role in moving towards a low GHG emission energy future. We note that natural gas has become an integral part of global energy supply”.

IGU have also engaged in several other activities and arenas. In April, we met with many of you at the LNG 18 Conference and Exhibition, successfully held in Perth, Australia. The Australians provided an excellent and fruitful week, featuring many high level speakers both from the industry and the Australian political environment. The conference sessions shared insights on changes in reserves, trade, geopolitics, technological developments, regulation, stakeholder management, pricing and investment in the gas industry. During this, IGU released a new edition of the IGU World LNG Report. Our congratulations go out to Barbara Jinks, Executive Director of LNG 18, and her team for a job well done.

Everywhere we go, whether in meetings with journalists, policymakers or diplomats, and conference presentations, we strive to raise the voice of gas. We speak about the future role of gas, about clean air, about its contributions to economic development and about gas as a partner to renewables. In this post-COP 21 world, it is critical to ensure natural gas expands its important role in the global energy mix.

This expanded advocacy effort was made possible in part by the restructuring of membership made in 2015. Your contributions allow us to engage more broadly and strategically.

In May, Mel Ydreos assumed the critical new position of Director of Public Affairs, leading IGU efforts in policy development, strategic communications and outreach. We also appointed a new Events Director, Rodney Cox, a globally-recognised conference and exhibition professional, who will steward the IGU conference portfolio in a way that adds value to our global industry, strengthens our brand and ensures the financial success of these events. We welcome Mel and Rodney to these new roles.

Thank you for continued support and active engagement as we work to enhance IGU’s relevance and contributions to the global gas industry.

With best regards,

David and Pål
ONE OF A KIND

- Holding the World’s Largest Gas Reserves
- Exploiting the Giant South Pars Field
- Unique Privilege of Pipeline/LNG Trade
- Huge Investment Opportunities
Members of IGU

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91 Charter Members
11 Premium Associate Members
50 Associate Members

Countries represented in IGU
We strive to create enduring, mutually beneficial partnerships. Together we succeed through a shared interest in achieving value across the supply chain.

Paul Reed  
CEO  
BP Integrated Supply and Trading

Using our knowledge and insights to help keep the world’s energy moving, our energy trading function is BP’s face to global energy markets. We offer a combination of expertise in physical supply and trading, innovative financial structures and advanced analytics to deliver long-term value, from wellhead to end customer. We trade a variety of physical products such as crude oil, refined products, natural gas, LNG and power. We deliver innovative solutions for our customers in a complex market.
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The world needs energy. Oil alone isn’t enough. So we’re investing in the responsible development of abundant natural gas. Off the coast of Western Australia, Chevron is developing two of the largest natural gas projects in the world. The world depends on energy. So that’s what we’re delivering.
### Premium Associate Members

- Abu Dhabi National Oil Company (ADNOC) Distribution (UAE)
- Anadarko Petroleum Corporation (USA)
- Australian Petroleum Production & Exploration Association – APPEA (Australia)
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- BP Gas Marketing Ltd (United Kingdom)
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- Cheniere Energy Inc. (USA)
- Chevron Corp. (USA)
- China LNG Association (China)
- China Petrochemical Corporation – Sinopec (China)
- COM-therm (Slovakia)
- ConocoPhillips Company (USA)
- DNV GL (Norway)
- Edison S.p.A. (Italy)
- Energodiagnostika (Russia)
- Eni (Italy)
- Eurogas
- ExxonMobil Gas & Power Marketing (USA)
- GasTerra B.V. (The Netherlands)
- GAZBIR – Association of Natural Gas Distributors of Turkey
- Indian Oil Corporation Ltd (India)
- Indonesian Gas Society (Indonesia)
- INPEX Corporation (Japan)
- Instituto Brasileiro de Petróleo, Gás e Biocombustíveis – IBP (Brazil)
- Korea Gas Corporation – KOGAS (Korea)
- PT Pertamina –Persero (Indonesia)
- Statoil ASA (Norway)
- TOTAL S.A. (France)
- Uniper (Germany)

### Associate Members

- Liander N.V. (The Netherlands)
- Linde AG (Germany)
- Mongolian Energy Economic Institute (Mongolia)
- N.V. Nederlandse Gasunie (The Netherlands)
- OMV Gas & Power GmbH (Austria)
- Origin Energy Limited (Australia)
- Petróleo Brasileiro S.A. – Petrobras (Brazil)
- Petronet LNG Limited (India)
- RasGas Company Limited (Qatar)
- Regas (Italy)
- Repsol S.A. (Spain)
- Russian Gas Society (Russia)
- Samsung Engineering Co. Ltd (Korea)
- Santos Ltd (Australia)
- Shell International Exploration & Production B.V. (The Netherlands)
- Société Suisse de l’Industrie du Gaz et des Eaux – SSIGE/SVGW (Switzerland)
- Sonorgás (Portugal)
- Spetsneftegaz NPO JSC (Russia)
- TAQA Arabia (Egypt)
- TG – Transportadora Brasileira Gasoduto Bolivia-Brasil S.A. (Brazil)
- TgP – Transportadora de Gas del Perú (Peru)
- Vopak LNG Holding B.V. (The Netherlands)
- Westnetz GmbH (Germany)
- Wintershall Holding GmbH (Germany)
- Woodside (Australia)

### Organisations Affiliated to IGU

- Energy Delta Institute (EDI)
- Gas Infrastructure Europe (GIE)
- Gas Technology Institute (GTI)
- GERG – Groupe Européen de Recherches Gazières/European Gas Research Group
- GILGNL – Groupe International des Importateurs de Gaz Naturel Liquéfié/International Group of LNG Importers
- NGV Global
- NGVA Europe – European Association for Bio/Natural Gas Vehicles
- International Pipe Line & Offshore Contractors Association (IPLoca)
- MARCOGAZ – Technical Association of the European Natural Gas Industry
- Pipeline Research Council International, Inc. (PRCI)
- Russian National Gas Vehicle Association (NGVRUS)
- World LPG Association (WLPGA)
Congratulations on your excellent work to the International Gas Union for 85 years driving the gas industry.

Today we want to recognise that effort. A big round of applause for your role in the technical and economic evolution of the gas industry and your contribution to the development of the energy of the present and the future. Above all, for doing this with the same enthusiasm and effort as always.

Because it doesn’t matter what you say, it matters what you do.

www.gasnaturalfenosa.com

gasNatural fenosa

Done and said
IGU Organisation 2015–2018

IGU Executive Committee

Mr Fethi Arabi, Algeria
Mr Javier Gremes Cordero, Argentina, Regional Coordinator Latin America and the Caribbean
Ms Cheryl Cartwright, Australia
Mr Augusto Salomon, Brazil
Ms Lixin Che, China, People’s Republic of
Mr Eduardo Pizano, Colombia
Mr Andreas Rau, Czech Republic
Mr Jérôme Ferrier, France
Mr Gerald Linke, Germany
Mr Hedayat Omidvar, Iran
Mr Andrea Stegher, Italy
Mr Shinichi Tada, Japan
Mr Jae Ho Song, Korea, Republic of
Mr Munseok Baek, Korea, Republic of
Mr Hazli Sham Kassim, Malaysia
Mr Han Fennema, Netherlands, The Regional Coordinator Europe
Mr Runar Tjersland, Norway
Mr Scott Ickes, Qatar
Mr Andrey Sapozhnikov, Russian Federation
Mr Antoni Peris Mingot, Spain
Mr David Carroll, United States of America
Mr Menelaos (Mel) Ydreos, United States of America
Mr Jean-Michel Figoli, Associate Member, ENGIE
Ms Cynthia Silveira, Associate Member, IBP
Mr Seunghoon Lee, Associate Member, KOGAS
Ms Yenni Andayani, Associate Member, Pertamina
Mr Chris Gunner, Associate Member, Shell
Ms Li Yalan, Regional Coordinator Asia and Asia-Pacific
Mr Gertjan Lankhorst, Regional Coordinator Europe
Mr Khaled Abubakr, Regional Coordinator Middle East and Africa
Mr Timothy M. Egan, Regional Coordinator North America
Mr Marcel Kramer, Regional Coordinator Russia, Black Sea and the Caspian area
Mr Pål Rasmussen, Secretary General
Mr Luis Bertrán Rafecas, Deputy Secretary General
IGU Management Team

Mr David Carroll, President (United States of America)

Mr Menelaos (Mel) Ydreos, Executive Director of Public Affairs and Chair of the Coordination Committee (United States of America)

Mr Pål Rasmussen, Secretary General

Mr Jae Ho Song, Vice President (Republic of Korea),

Mr Munseok Baek, Vice Chair of the Coordination Committee (Republic of Korea)

Mr Luis Bertrán Rafecas, Deputy Secretary General

Mr Jérôme Ferrier, Immediate Past President (France)

IGU Secretariat

The staff of the IGU Secretariat as of October 2016:
(from left to right in the front row) Antonia Fernández Corrales, Senior Advisor; Luis Betrán Rafecas, Deputy Secretary General; Pål Rasmussen, Secretary General; Mats Fredriksson, Director; Taeksang Kwon, Senior Advisor; (from left to right in the back row) Torstein Indreba, Honorary Secretary General; Anette Serum Nordal, Information Consultant and Secretary of the Coordination Committee; Kristen Sande, Administration Consultant; Sjur Runar Bayum, Senior Advisor.
Driven by concerns about the air quality in the State of Qatar, RasGas Company Limited (RasGas), one of the world’s premier integrated liquefied natural gas (LNG) companies, worked with the country’s Ministry of Municipality and Environment (MME) to initiate an intensive 10-year nitrogen oxides (NOx) emissions reduction programme, which has been successful beyond expectations.

At present, the company’s NOx emission levels from gas-fired turbines covered by the programme are less than 50 milligrams (mg)/Normal cubic metre (Nm³), far outperforming the MME regulatory limit of 125 mg/Nm³.

With the successful completion of the last two Frame 7 Turbine Dry Low NOx (DLN) retrofit in May 2016, RasGas is expected to reach an overall reduction in NOx emissions intensity by 90% by the end of 2016, compared to 2006 levels.

“This incredible result is a testimony to RasGas’ ongoing commitment to clean air,” confirms the company’s Chief Executive Officer, Hamad Mubarak Al Muhannadi.

It’s a commitment spanning a decade, beginning in 2007, when RasGas applied General Electric’s groundbreaking DLN technology to the company’s gas-fired turbines built before 2005 to mitigate environmental concerns about local air quality.

NOx emissions, if left unchecked, can react to form haze or smog, and may be central to the formation of fine particles in air and ground-level ozone. The DLN gas turbine cooling reduction technology programme is designed to limit the amount of NOx emissions from gas-fired turbines, by mixing the gas fuel with air prior to burning the mixture, eliminating the need to inject water or steam.

“As a LNG exporter, RasGas is committed to supplying the world with more environmentally-friendly energy, and our company means to continue producing safe and reliable energy without compromising the needs of future generations,” says Al Muhannadi.

The Philip Townsend Associates Incorporated benchmarking report confirmed in 2014 that RasGas’ NOx emissions intensity, expressed in weight percentage of total intake, was better than the LNG industry average by 70%, with the Qatari company ranking top of the 14 benchmarked LNG companies.

About RasGas
RasGas Company Limited (RasGas) is a Qatari joint stock company, established in 2001 by Qatar Petroleum and ExxonMobil RasGas Inc. The company oversees and manages all operations associated with seven LNG trains, two sales gas production facilities, two helium production facilities, and major shipping contracts and global commercial partnerships. It has also developed world-class offshore and onshore facilities for the extraction, processing, liquefaction and storage of gas from Qatar’s North Field. RasGas’ primary product is LNG for export, for which it has a total production capacity of approximately 37 million tonnes per annum.
ENERGY for life

Energy powers our world, it enriches our lives.
Qatari artist Yousef Ahmed uses energy as an inspiration for his art. It fuels his imagination.
RasGas’ liquefied natural gas has a transformative and sustainable effect on Qatar’s future.
Clean, reliable energy for Qatar and the world.
Energy for Life.

“Energy and form are a major inspiration for my work”
Yousef Ahmad - Artist
These changes and achievements have been made in cooperation with the Presidencies of Argentina, Malaysia, France and now the USA, and they would not have been possible without the strong support of the host of the IGU Secretariat, Statoil ASA. Through nine years, Statoil ASA has been the sponsor of the Secretariat providing office facilities, personnel and back office services. With that, the company is the single largest contributor to IGU ever, and IGU expresses its warmest gratitude and appreciation for this vital support.

A brochure has been prepared by IGU for the upcoming IGU Council meeting in Amsterdam, the Netherlands, which sums up the achievements and changes during the Norwegian Secretariat period. This brochure gives a broader overview, but some are also worth mentioning here:

\[\text{Secretariat transition}\]

On 1 November 2016 the Secretariat is moving from Norway to Spain and we would like to take this opportunity to look back at some of the achievements of our organisation over the last nine years.

The IGU Secretariat moved from Copenhagen, Denmark, to Oslo, Norway, in 2007. Since then a lot has been achieved, including the maturation of some processes already begun under the Danish Secretariat period, but to a great extent by taking on new initiatives. The organisation of IGU has expanded since Norway took over nine years ago. Several measures have been taken in order to respond to the challenges of the gas industry and its business environment, to develop IGU into a global voice of gas and to ensure that the organisation is kept relevant to its members.

On 12 August, the IGU President and Secretary General met with Statoil ASA CEO, Eldar Sætre, in Stavanger, Norway, to thank him for Statoil’s contribution to IGU over the last 9 years. Since 2007, Statoil has been the sponsor of the IGU Secretariat. A gift, presenting four characteristic IGU polar bears, was handed over in appreciation of the support. Potential future cooperation between Statoil and IGU was also discussed.
KOGAS will second another person to join the team in Barcelona. Hyunchang Kim will serve as Advisor to the Secretary General.

**Spanish team**
The Secretariat transfer preparations have already been well underway for several months. The Secretariat team which will take over the IGU’s daily activities in Barcelona on 1 November includes four people who have already worked with the Secretariat in Oslo. Gas Natural Fenosa seconded Senior Advisor, Antonia Fernández Corrales to the Secretariat in October 2015 and the elected Deputy Secretary General, Luis Bertrán Rafecas joined the Secretariat in Oslo in February 2016. In addition to these two, Senior Advisor, Taeksang Kwon, and Coordination Committee Secretary and Information Consultant, Anette Sørum Nordal, will also transfer to Spain and continue working in their positions.

Two new secondees from Gas Natural Fenosa have been appointed and are ready to take on their tasks. Luisa Peris will take on the role of Executive Assistant, while Rafael Huarte will assume the position of IGU Director.
The first of the appointments is in order to increase the activities helping to raise the global voice of gas. Mel Ydreos was appointed IGU Executive Director of Public Affairs in May 2016. The announcement has freed up capacity to increase IGU’s focus on advocacy for natural gas in the current and future energy mix and make this more effective, while at the same time continuing to drive value through the triennial work programme, and is a consequence of the approvals given by the Council in Paris, June 2015. In his new position Mel Ydreos is accountable for IGU’s advocacy efforts and will have more time to focus on this part of his work. He will continue to work with the Strategic Communications and Outreach Task Force and the Executive Committee to build on IGU’s early advocacy successes.

Officially Mel also retains the Chairmanship of the Coordination Committee (CC), but an Acting CC Chair was appointed in June to manage the day-to-day activities of the committee. This is of particular importance as preparations continue for WGC 2018 in Washington DC. Rod Rinholm, who is currently Executive Director, Business Development and Education at GTI in Chicago, assumed the Acting Chair position. As a seasoned executive with considerable international experience and participation in many IGU related activities, he knows IGU well. He is a member of IGU’s R&D and Innovation Committee and sits on the Steering Committee for the LNG 2019 Conference and Exhibition in Shanghai.

The Building for the Future project not only seeks to ensure that advocacy, communication and outreach is well taken care of, but also that the IGU events portfolio is managed in the best way. In August, Rodney Cox assumed the position of IGU Events Director. This new role will guide the development and execution of IGU’s events: the World Gas Conference, the LNG Conference and Exhibition series, the International Gas Research Conferences (IGRCs) and potential new conferences. As David has therefore also been made and will be distributed in Amsterdam.

**Building for the Future**

The Secretariat will soon be on the move, but other organisational changes have also taken place within IGU over recent months. Under the Building for the Future project two new positions have been created, and as a consequence of this, at third appointment has been made.
Enagás, LNG benchmark in innovation and know-how

Enagás is an international standard bearer in the development and maintenance of gas infrastructures and in the operation and management of gas networks, mainly LNG terminals, pipelines and underground storages.

A Spanish midstream gas company present in eight countries: Spain, Mexico, Chile, Peru, Sweden, Greece, Albania and Italy. The company is certified as an independent Transmission System Operator (TSO) by the EU. Enagás has developed the key infrastructures for the Spanish Gas System, transforming it into a benchmark for security and diversification of supply. In Spain, the company is the main carrier of natural gas, with more than 12,000 km of pipelines, and is also the Technical System Manager.

LNG developments

With almost 50 years of history behind it, Enagás is one of the companies with the most LNG regasification terminals in the world.

The company has gone through a process of transforming from a traditional business model into new advancements, mainly within the LNG sector, and has implemented new developments and adaptations. The main target has been improving LNG terminals with multimodal developments to offer new small-, medium- and large-scale services. All this to adjust to a more demanding market requires responses to a number of technical challenges with innovative solutions regarding the management model, maximizing availability at existing assets, and adding efficiency to the classical value chain integrating new logistic services.

To meet these demands, Enagás has implemented significant LNG terminal modifications, while maintaining a high quality of service, with no major security incidents.

An example of this is the CORE LNGas hive project that has received support and funding from the European Commission and is coordinated by Enagás. This project aims to develop an LNG supply chain for the supply of use of natural gas as a transportation fuel, especially for maritime transport. CORE LNGas hive has a total of 42 partners from Spain and Portugal and will contribute to the decarbonisation of the Iberian Peninsula, allowing maritime transportation in the Mediterranean and Atlantic corridors to comply with the more strict environmental regulation, as natural gas is the least polluting fossil fuel.

Through these endeavours the company has become a beacon in sustainability, good governance, knowledge and innovation in the sector. Moreover, all the logistics know-how the company has developed is at the service of similar needs worldwide and at other infrastructures and LNG projects.
One of the main deliveries of 2016 was the G20 Natural Gas Day held in Beijing, China, on 29 June. A separate article covers this more in detail on pages 44-46, but the event, co-hosted with the National Energy Administration of China, was an eminent opportunity to explore the opportunities of gas together with G20 energy ministers, policymakers, academics and representatives of the international gas business. The event also generated good press coverage in different media and resulted in a dedicated paragraph on natural gas in the communique issued by the G20 Energy Ministers meeting that was held one day after the Natural Gas Day.

More activities are planned for the second half of 2016, amongst other the release of a second edition of the urban clean air report featuring new case studies as examples of the great potential of gas on this issue. IGU is also moving forward with the IGU Diplomatic Gas Forums. Three forums are planned for this year in Amsterdam, Washington DC and Oslo.

The IEF-IGU Ministerial Gas Forum is set for 6 December 2016 in New Delhi, India. The event is a discussion arena for energy ministers.
Mozambique LNG is emerging as a leader in the global LNG industry, with 75+ trillion cubic feet of estimated recoverable natural gas discovered in Mozambique’s Offshore Area 1.

The project is advancing an onshore liquefied natural gas (LNG) park on the Afungi peninsula in Cabo Delgado province. This is the first-of-its-kind LNG facility on the east coast of Africa.

The independently certified reserves are sufficient to support two initial LNG trains, each with capacity of 6 million tonnes per annum (MMTPA), as well as to accommodate expansions, including multiple additional trains capable of producing approximately 50 MMTPA of LNG in future years.

The Project Participants have the expertise, skill, commitment and knowledge to safely deliver this world-class LNG Project.
and CEOs of the gas industry. New Delhi was chosen as the venue because the Indian government is highly concerned about air quality issues and natural gas is expected to grow in the country. The discussions will take place under the overall theme ‘Gas for Growth. Improving economic prosperity and living standards’.

Representations
 Meetings with IGU Charter and Associate members

Meeting with IGU members to share ambitions and plans and at the same time get feedback on how we are doing is currently a focus area for IGU. The IGU leadership team has taken the opportunity when travelling to different locations for conferences and meetings to do this. Since January, David Carroll, Pål Rasmussen and Mel Ydreos have among others met with IGU Charter member for the United Kingdom, the Institute of Gas Engineers and Managers (IGEM), IGU Charter member for Brazil (ABEGAS) and with Petoro which has taken over the Charter membership for Norway after the Norwegian Gas Association was closed down. They have also met with several IGU Associate members such as BP, Transportadora Brasileira Gasoduto Bolivia-Brasil S/A, the Brazilian Petroleum, Gas and Biofuels Institute (IBP), and Petrobras.

At the LNG 18 Conference and Exhibition in Perth the same team met with high-level representatives of key actors in the industry including:

- APPEA: Dr Malcolm Roberts, CEO, and Stedman Ellis, Chief Operating Officer – Western Region.
- RasGas: Hamad Mubarak Al-Muhannadi, CEO and Khalid Sultan Al-Kuwari, Chief Marketing & Shipping Officer.
- Shell: Maarten Wetslaar, Executive Vice President.
- ConocoPhillips: Bill Bullock, President, Asia Pacific & Middle East; Mike Culligan, Manager, LNG Technology & Licensing.
Gas contributes to energy transition

With ENGIE, energy is now full of creativity.

As a key international player in gas, ENGIE develops efficient and environmentally-friendly solutions such as Biomethane and Liquefied Natural Gas.

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New from the Presidency and Secretariat

The Secretary General has been present at all of them and Mel Ydreos, David Carroll and Antonia Fernández Corrales, Senior Advisor, participated in some of them with him. IGU has used the meetings to meet with representatives of the G20 members, invited countries (for 2016 this is Egypt, Kazakhstan and Sudan) and representatives of relevant international organisations. Support to the Chinese presidency on the agenda item Clean Energy has been important as has continued participation of our organisation in the working group. IGU has on several occasions met with the German delegation to discuss this. Germany will assume the G20 Presidency next year.

Visit to Vail Global Energy Forum, Beaver Creek, Colorado
In January the Vail Global Energy Forum Foundation in partnership with the Stanford Precourt Institute for Energy and the Stanford Precourt Energy Efficiency Center organised the Vail Global Energy Forum in Beaver Creek, Colorado. The IGU President attended the forum along with other leaders from government, the energy industry and academia on 30 January. It was the fifth time the forum was held, this year under the theme ‘The Rise of North America and the Future of Energy’. The IGU President spoke on a panel that highlighted the role of natural gas in global economic development.

Visit to Gassco
In August the IGU President and Secretary General paid a visit to the CEO of Gassco, Frode Leversund, in Haugesund, Norway, to thank the company of the secondment of Pål Rasmussen to the IGU Secretariat and to discuss potential future cooperation. Gassco has been a member of IGU through the Norwegian Gas Association.

World Petroleum Council and International Association of Oil and Gas Producers
In mid-January, while in London for a WGC 2018 planning meeting, the President, Secretary General and CC Chair met with Ulrike von Lonski, Director of Communications, at the World Petroleum Council in London. The aim of the meeting was to give an update on IGU activities and be updated on the World Petroleum Council’s activities.

They also met with the new Association of Oil and Gas Producers (IOGP) Executive Director Gordon Ballard, the former IOGP Executive Director, Michael Engell-Jensen and External Affairs Manager Lloyd Slater at IOGP headquarters.

G20
So far this year there has been three meetings in the G20 Energy Sustainability Working Group (ESWG). The Secretary General has been present at all of them and Mel Ydreos, David Carroll and Antonia Fernández Corrales, Senior Advisor, participated in some of them with him. IGU has used the meetings to meet with representatives of the G20 members, invited countries (for 2016 this is Egypt, Kazakhstan and Sudan) and representatives of relevant international organisations. Support to the Chinese presidency on the agenda item Clean Energy has been important as has continued participation of our organisation in the working group. IGU has on several occasions met with the German delegation to discuss this. Germany will assume the G20 Presidency next year.
We meet the world’s energy challenges through our projects

From the deepest subsea developments to the largest gas processing complexes, we offer the best solutions to meet the world’s energy challenges.

If you want experience, innovation and proprietary technologies; solid values safeguarding human health and the environment; successful alliances, flexibility, quality and safety excellence, we are your ideal partner.

We are one of the world’s leading Contractors in the Energy sector. And we will take you further.

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visited the conference venue. IGRC 2017 will be held in Rio de Janeiro, 24-26 May 2017.

7th Mediterranean Oil & Gas Forum 2016
The Mediterranean Oil and Gas Forum has, since 2010, been organised annually by Energy Ministers from the Mediterranean and Caspian regions. It is a forum for the oil and gas industry in the region, attracting investors, government leaders and oil executives. The CC Chair attended the 7th Mediterranean Oil and Gas Forum on 1-2 March 2016 in Nicosia, Cyprus. In relation to the conference he met with IGU members and potential members from the region in a Regional Members dinner.

India Energy Week 2016
India Energy Week 2016 took place in New Delhi, India on the 7-10 March. The Secretary General participated in the conference with a speech on ‘Global Gas Fundamentals: Where do we go from here?’ and also took the opportunity to meet with Indian IGU members GAIL, Petronet LNG Limited and Indian Oil Corporation Limited.

The Norwegian Gas Conference
The theme of this year’s Norwegian Gas Conference in Bergen, Norway, was “Possibilities for natural gas in the green energy transition”. The Secretary General shared IGU’s view on this with the conference delegates through his presentation: ‘Use of gas – after Paris’.

7th Central European Gas Congress
The IGU President participated at the 7th Central European Gas Congress in Bratislava, Slovakia. The event was organised by IGU Charter member the Slovakian Gas and Oil Association. The President gave a keynote...
speech where he spoke about the future of gas under the title ‘Fueling the Future with Gas: An IGU Perspective’.

**International Energy Agency**

At the beginning of May the IGU President and Secretary General met with IEA Executive Director, Fatih Birol, in Paris, France. The IEA is thinking about establishing an IEA Gas Advisory Board and the three discussed further cooperation between IGU and IEA especially on this issue.

**G20 Ministerial Energy Meeting**

The President and Secretary General attended the G20 Ministerial Energy meeting in Beijing, China. The President conveyed a statement from the G20 Natural Gas Day to the meeting (see report on pages 44-46).

**YPFB Oil & Gas 2016**

The YPFB Oil & Gas Conference is organised by IGU Charter member for Bolivia, Yacimientos Petrolíferos Fiscales Bolivianos (YPFB). This year’s conference topic was ‘Resilience: The Oil & Gas response’. IGU was represented by the Secretary General who gave a keynote address on the opportunities for gas industry companies after COP 21.

**Flame 2016**

The Flame 2016 Conference in Amsterdam, the Netherlands, was designated Europe’s leading natural gas and LNG conference. The IGU President attended on IGU’s behalf and spoke in a panel with Gertjan Lankhorst, CEO of GasTerra and IGU Regional Coordinator for Europe.

**Oil and Gas Uzbekistan**

This year was the 20th Anniversary Oil and Gas Uzbekistan (OGU) Conference and Exhibition and the IGU Secretary General was invited to give a speech at the Opening Ceremony. The conference and exhibition is organised by IGU Charter member Uzbekneftegaz. It is the country’s largest event in the oil and gas sector and organised under the support of the Government of the Republic of Uzbekistan.

**GTI celebrates 75 years**

The Gas Technology Institute (GTI) celebrated its 75th Anniversary in Chicago and both the IGU President (also the President of GTI) and the IGU Secretary General participated in the event. The Secretary General took the opportunity to speak about global gas fundamentals.

**UNECE**

The Deputy Secretary General, Luis Bertrán Rafecas and Torstein Indrebø, Honorary Secretary General, met with Scott Foster, Director, Sustainable Energy Division, United Nations Economic Commission for Europe (UNECE), in Oslo, Norway, to discuss issues of overlap between the two organisations and possible further cooperation.

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7th National Energy Forum, Malaysia
The Executive Director of Public Affairs, Mel Ydreos, attended the 7th National Energy Forum in Kuala Lumpur, Malaysia on 8 September. The Forum was organised by IGU Charter member the Malaysian Gas Association (MGA), in addition to Suruhanjaya Tenaga (ST) and the Energy Council of Malaysia (ECOM). The theme of this year’s Forum was ‘Energy Transformation in Malaysia – Towards a sustainable equilibrium’ and Mel Ydreos delivered the keynote.

10th European Gas Summit
The 10th anniversary European Gas Summit was held in Dusseldorf from 27-28 September. Luis Bertrán Rafecas, Deputy Secretary General, spoke on IGU’s behalf. His speech focused on how gas and renewables can help Europe pursue post-COP 21 goals and how gas can, at the same time, contribute in improving urban air quality.
DELIVERING
ALMOST
A FIFTH OF THE
WORLD’S LNG

IT’S WHAT MAKES
A WORLD LEADER
We deliver 42 million tons of Liquefied Natural Gas a year to our customers safely and reliably, making us the largest producer in the world. This achievement together with a commitment to operating excellence, innovation and CSR makes Qatargas the World’s Premier LNG Company.
While Phase I of the Building for the Future project is now well underway, we have moved to Phase II. We are currently taking a strategic review of the IGU’s event portfolio, looking at different ways in which it can be optimised. All three IGU conferences are globally recognised within the gas industry and have a long history. They are hence one of IGU’s best opportunities to profile our organisation and work. In order to do this it is, however, necessary to optimise the events with regard to the strategic policies, branding/positioning, conference programme, commercial model and organisational model.

We got the approval for Phase II from the Council in Cartagena, Colombia, and there has already been good progress. Over the last six months a number of the identified elements have been implemented. For most of our events we have now agreed with the individual NOC to establish Steering Committees. These will make it possible for IGU to be more involved, gain experience and obtain better control over the planning and running of each event. Only this way can IGU establish a clear branding and role accountability and create strong alignment to the IGU Vision and Mission for each IGU event.

With the new Steering Committees IGU will have stronger involvement and this requires both more resources and expertise. As of 1 August we have therefore appointed an IGU Events Director, Rodney Cox. The appointment of an Events Director is aimed at strengthening IGU’s brand by ensuring consistently high quality conference events.

By engaging Rodney we fulfilled one of the key recommendations from IGU’s Building for the Future Phase II.

With the appointment of an Events Director, we also launched Phase III of the Building for the Future initiative that will assess potential changes to the governance and organisation of IGU. In recent years IGU has responded to the changes of our industry with new strategic initiatives. A successful completion of these new initiatives requires a realistic assessment of how IGU should develop and change to best do this. In April 2016, the IGU Management Team was asked by the Executive Committee in Durban to accelerate the changes in IGU’s governance. As a consequence we are also now working to refine the IGU staff goals and objectives and identify strategies for achieving those goals. We are establishing guiding principles on which changes to the organisation should be based and defining and analysing at a high level alternative governance models for IGU. Last, but by no means least, we are outlining changes in key accountabilities relative to the current model. Luis Bertrán Rafecas, Deputy Secretary General, is leading this effort with a target of delivering preliminary findings and recommendation at the October meeting of the IGU Council in Amsterdam.

For me, it has been a pleasure to drive forward the Building for the Future project, and to see the implementation of the different parts of project. I would like to take this opportunity to thank everyone that has been involved Phase I and Phase II, and also those who are supporting IGU in maturing Phase III.
Fueling the Future

Around the world, natural gas has tremendous potential for growth. The USA triennium is leading the International Gas Union and helping strengthen the global voice of gas to leverage the vast opportunities that exist and support market expansion across the globe.
The IGU Council Meeting, Durban

The first IGU Executive Committee and Coordination Committee meetings of 2016 were held in beautiful Durban, South Africa, 5-7 April. iGas, the South African host, worked tirelessly to create an outstanding environment around the meetings. Particularly through their Chief Operating Officer, Mike de Pontes, the organisation of both professional and social programmes were excellently carried out.

As described in a previous edition of the magazine (International Gas, October 2015 – March 2016, pages 46-47), the Executive Committee (EXC) meetings have been restructured in order to allow for greater member engagement, networking, and knowledge transfer. The restructured agenda divided the EXC meeting into two parts, the first focusing on administrative issues, the second on discussion and debate. Important agenda items were the discussion of three IGU policy positions under development, approval of phase two of the Building for the Future project and the endorsement of the new Vice Chair of the Coordination Committee, Dr Munseok Baek, after the resignation of Dr Gi Chul Jung from the position.

To engage the EXC members, a request was sent to the members in advance of the meeting for inputs to the meeting agenda. One suggestion was received suggesting regular updates on all flagship conferences, not only the World Gas Conference as has been the tradition. This was reflected in the meeting and will be a standard agenda item going forward.

In the meeting, the Executive Committee engaged broadly in the discussions. The members also asked for time on their own without the management team present in order to discuss the need for a strategic communication and outreach director.
Policy Positions
Based on a recommendation from the newly established Strategic Communication and Outreach task force, IGU is working to develop policy positions on the most topical questions and themes of the current energy debate. In order to raise the global voice of gas, the gas industry must stand together and provide concise and clear messages to policymakers and stakeholders. Policy positions will allow for such concise messaging on how and where natural gas has a role to play in the future energy mix.

Building for the Future
Phase II of the Building for the Future project has performed a strategic review of the IGU events portfolio and looked at how IGU can optimise its events in terms of strategic policies, branding and positioning, conference programme, and the commercial and organisational models. Through the approval given by the Executive Committee IGU will work further to develop the portfolio, establishing steering committees for all the conferences, developing branding guidelines and through other methods.

Executive Committee Workshop
The Executive Committee Workshop provided key insights on the opportunities and challenges for the African gas industry. The African continent has tremendous opportunities with regards to energy and natural gas, but as the workshop also showed, there are still challenges to overcome. Many African countries, including South Africa and its neighbours, are rich in gas resources. Extraction of these will help meet both energy needs and the ambitions to reduce CO₂ emissions. But at the same time, lacks of infrastructure and difficult economic and regulatory environments are demanding. There are no one size fits all solutions and each country must find its own methods to extract resources in ways that will be beneficial to the country and at the same time attractive to investors.
Strategic Communications and Outreach task force

Durban also hosted the second meetings of the Coordination Committee (CC) meeting and the Strategic Communications and Outreach task force for the triennium. The CC focused on finalising the triennium work plans and understanding work activities between committees that could be consolidated into thematic reports and thematic sessions at the World Gas Conference (WGC) in Washington DC in 2018. Guidance on the structure and expectations at the Industry Insight sessions and the Technical and Innovation sessions of the World Gas Conference was another important agenda item.

A significant part of the Strategic Communication and Outreach task force meeting was focused on the discussion about how IGU can sustain and create greater focus on advocacy. The IGU’s 2016 Strategic Calendar and the development of policy positions were also discussed.
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G20 Natural Gas Day successfully held in Beijing

By Li Yalan

On June 29, 2016 the G20 Natural Gas Day, co-hosted by the National Energy Administration of China and the International Gas Union, was successfully held in Beijing. Beijing Gas Group Company Limited, jointly with China Gas Society and China Gas Association co-organised the event. Over 300 delegates including energy ministers from the G20 countries, international organizations, key industrial players, consulting and financial companies participated in the event.

Zhang Gaoli, Vice Premier of China and Dr Shamshad Akhtar, Under-Secretary-General of the United Nations, delivered the welcome speech on the Joint Opening Ceremony for G20 Energy Ministerial Meeting, G20 Conference on Energy Access and G20 Natural Gas Day. David Carroll, President of IGU, Dr Fatih Birol, Executive Director of the International Energy Agency (IEA) and Li Fanrong, Vice Administrator of China’s National Energy Administration (NEA) all spoke in the opening session of the G20 Natural Gas Day which was followed by three panel sessions centring on the theme of ‘Natural Gas – Promoting Sustainable Development’.

The G20 Natural Gas Day had great significance to Asia and the global gas industry. The event has clarified the role of natural gas in energy transition. Natural gas is not a transitional energy; rather, it is the fundamental fuel of the future energy mix. Natural gas is a clean and efficient fossil fuel. It has unique advantages including supply stability, technology viability and flexibility. In recent years, the improvement of exploration and extraction technology has significantly improved the production level of natural gas, thus bringing profound change to the structure of the world energy supply. Meanwhile, as a clean form of energy with great adaptability, the application of natural gas in power generation and transportation has also been rapidly expanded. Natural gas as an economic, secure and flexible energy source has a great development potential. Natural gas is a way leading to energy transition. Governments around the world should remove bias towards natural gas and launch more favourable policies to promote the development of natural gas to embrace the ‘golden era’ for natural gas.

David Carroll reported the results of the event to the G20 Energy Ministerial Meeting. The G20 Natural Gas Day sends a strong message to the world that natural gas is an accessible, affordable, economic, clean and...
sustainable fuel that is the fundamental energy for our future energy mix.

Beijing as location of the G20 Natural Gas Day was a specially good one. Beijing has dedicated great efforts and made major achievements in converting from coal power to natural gas and on improving air quality. Last year, natural gas consumption in Beijing exceeded 14 bcm. Beijing ranks third in the world for gas consumption in a single city. It presents a strong case to the world that using natural gas can improve the environment. However, even with such a large consumption volume, Beijing still lags far behind the world average level for the ratio of natural gas in the primary energy mix. The rest of China’s cities has an even greater gap to reach the world average level. In China natural gas accounts for only 5.8% of the primary energy mix. Li Fanrong pointed out that the Chinese government has already taken active measures to increase the consumption of natural gas with the aim to control air pollution. By 2030, natural gas is expected to account for 15% of the primary energy mix. Natural gas has huge room for further growth in Asia and the rest of the world. Clarifying the position of natural gas as a fundamental fuel has great importance in promoting the further development of both the Asian and world gas industry.
in storage and transportation, affects the competitiveness of natural gas against traditional fossil fuels in markets far away from gas fields. With favourable policy support, renewable energy achieved rapid development. Technological breakthroughs in renewables could bring fundamental change to the current energy mix. Natural gas still faces double pressures. The market players should work together to reduce costs and improve the competitiveness of the natural gas industry.

This is the first time a Natural Gas Day has been held under the G20 framework. It is an important step forward to shape the role of natural gas in global energy governance.

Li Fanrong praised both the G20 Natural Gas Day and the work undertaken by Beijing Gas Company Ltd. As he underlined, the “G20 Natural Gas Day is a great success. It is a high-level, in-depth, effective global natural gas summit; an experts dialogue filled with wisdoms and observations”.

While we see the major opportunities and potential for natural gas, we should not ignore the difficulties and challenges facing the industry. Li Fanrong highlighted at the event that the high cost of natural gas, in particular...
Find & Deliver
Natural gas for a safe and stable climate
Reports from the Regional Coordinators

In this issue we bring you updates from IGU’s Regional Coordinators for Africa and the Middle East; Latin America and the Caribbean; and from Russia, the Black Sea and Caspian Area.

◆ For Africa, gas is the future.
◆ IGU has a major role to play in this part of the world.

In IGU we are very excited about these two conclusions. It puts more responsibility on the shoulders of the USA triennium.

Update on developments in Africa and the Middle East

By Khaled Abubakr

Sub-Saharan Africa

Last April, South Africa hosted the Executive Committee meetings in Durban (for a full report see pages 40-42). This was a major milestone to bring the gas world to Africa and Africa to the gas world.

The meetings, and the workshop that followed, were very interesting and confirmed a different dimension and role for gas to enhance quality of life and fuel ambitious economic growth. The level of participation and speakers from governments and different International and financial organisations confirmed two major conclusions:

East and West Africa

Many investment decisions are pending in East Africa, mainly due to the impact of low gas prices and the high cost of E&P and LNG projects, slowing down most development processes. However, West Africa has witnessed more progress in development, floating storage and regasification and utilisation of Gas.

North Africa and East Mediterranean

Both Algeria and Egypt’s markets are getting more dependent on gas as a prime source of energy to spur on their economic growth.

In Egypt, huge progress has been made in developing ENI’s newly discovered Zohr gas dep-
Developments in Latin America and the Caribbean

By Javier Gremes Cordero

Regional overview

Natural gas accounts for 26% of the Latin American and Caribbean energy matrix. The environmental advantages presented by natural gas for industrial, electricity or transportation purposes as a substitute for coal and liquid fuels lead to the assumption that in the approaching decades gas will considerably increase its share in the worldwide and regional energy matrix. There is a solid international consensus that supports this expected trend.

The need to decarbonise the economy, the growing share of non-conventional renewable energies in the electricity generation matrix, greater NGL market fluidity given the expected increase of supply, global availability and fast-evolving technological advances will increase the flexibility and competitiveness of liquefaction and regasification investments.

The Latin American and Caribbean region produces approximately 7% of the world’s natural gas and its deficit is covered by means of imports. The demand for natural gas presents a growing trend derived from natural

Khaled Abubakr is Chairman of TAQA Arabia and the IGU Regional Coordinator for Africa and the Middle East.

Middle East

Gulf countries are becoming more wise consumers of gas, focusing on efficiency and optimising gas utilisation.

Iraq and Syria are on hold until the region embraces more peace and stability.

Jordan is using its new Floating Storage and Regasification Unit (FSRU) almost to its full capacity, while Egypt has commissioned its second FSRU and launched a bid for a third.

Finally, with all these excitements and the dynamism in the region, we in the IGU have worked to carefully shaped our message to world leaders for delivery at China’s G20 Natural Gas Day.

Argentina’s huge unconventional gas reserves, while currently supplying the country, show great potential for future production.
thermal generation, heating and industrial purposes and has 8.5 million connected users. Unconventional gas represents a challenge for worldwide gas supply growth. Over the last few years, starting with the development of the Vaca Muerta and Los Molles geological formations, Argentina has intensified the exploitation of its unconventional gas reserves. According to the United States Energy Information Administration these reserves – namely 22.7 tcm of shale gas resources – have a huge potential and nowadays, supply the total gas produced in the country.

The greatest amount of this gas will be supplied from the development of unconventional resources. This will also allow the increase of gas-fired thermal generation, which will provide flexibility to the electricity system and will allow the required diversification of the energy matrix. According to the survey, renewable energy should be added at a rate of 1,000 MW per year.

Regional LNG dynamics and intraregional gas flows

The international LNG market has presented great dynamism over recent years. Regasification capacity doubled between 2007 and 2014 and global liquefaction capacity has been installed in 19 countries.

The Latin America and Caribbean region has two exporting countries in Trinidad & Tobago and Peru. There are nine regasification terminals currently in operations: in Chile (2), Argentina (2), Brazil (3), the Dominican Republic (1) and Puerto Rico (1). The growth of regasification capacity is being implemented through projects being developed in Colombia, Chile and Uruguay, some newer projects with a less advanced status in Brazil and, mainly in several Central American and Caribbean countries like Panama, linked to electricity generation projects.

Regarding gas transportation through pipelines, Bolivia has vast gas potential and proven reserves in a traditional area, mature in...
In the right hands, oil and natural gas are more than natural resources. They are a foundation. As prime architects of Trinidad and Tobago's natural gas-based energy sector, The National Gas Company of Trinidad and Tobago Limited (NGC) has helped build an industrial powerhouse from our nation's raw hydrocarbon wealth. Since 1975, we have pioneered a model of natural gas-based utilisation that adds maximum value for the benefit of the nation and its people. And though every nation is different, the principles and practices that guide our operations can be applied across the globe.

NGC is an integrated group of companies with an asset base of US$6 billion, making it one of the largest companies in the Caribbean and Latin America by assets. Strategically positioned in the midstream of the local natural gas value chain, its customers include power generation, global scale petrochemical and iron and steel plants, and a wide range of light manufacturing and commercial enterprises. Our credit rating is A- from Standard and Poor's, Baa2 from Moody's and AAA from CarCriss rating agencies.

NGC is engaged in natural gas-based development and merchandising; natural gas compression, aggregation, transportation and distribution; natural gas pipeline construction, operation and maintenance; Liquified Natural Gas (LNG) production, marketing and shipping; offshore oil and gas production; development and management of industrial sites and port and marine infrastructure; aggregation, fractionation and marketing of Natural Gas Liquids (NGLs); and marketing of Compressed Natural Gas (CNG).

Through our strategic approach, we have successfully ensured both the profitability of the gas-based energy sector, as well as contributed to the social, economic and industrial development of Trinidad and Tobago. Through our investments, strategic partnerships and pioneering gas-pricing model, we have made a tremendous impact on the country's natural gas sector and economy.

We are dedicated to sustainability, community and Corporate Social Responsibility (CSR). NGC's CSR programme is one of the most extensive in the nation. We focus on Sports, Civic Life, Empowerment and the Environment, the latter being a 10-year 'no net loss' reforestation programme.

NGC’S MISSION
To create exceptional national value from natural gas and energy business.

NGC’S VISION
To be a valued partner in the global energy business.
geological terms and highly competitive. The country has a developed pipeline infrastructure that allows it to address both its local and exports market demands and is South America’s largest natural gas exporter through pipelines by virtue of agreements entered into with Brazil and Argentina.

The volume of gas supplied to Uruguay’s market from Argentina amounts to 300,000 m³/d. Colombia currently exports gas though in the coming years is expected to become an importing country, supplied by Venezuela. In May 2015, Argentina started to import gas from Chile through the Norandino and Gas Andes pipelines, by means of short-term contracts to meet winter demand.

To sum up, it is expected that within a regional scope the gap between natural gas supply and demand will continue to be covered by means of imports. In the current scenario, the expected LNG flexibility in the international market, added to the oversupply of unconventional gas proceeding from United States at low prices, will benefit importing countries in the region, and new regasification projects are expected to thrive in Latin America and the Caribbean.

**Main trends expected in the natural gas sector**

The two main trends observed both within a regional and global scope are the growth of renewable energies, chiefly wind and photovoltaic solar energy, and the rise of natural gas-fired electricity.

Environmental restrictions, strengthened by the agreement reached at COP 21 in Paris, will tend to slowly reduce carbon and oil by-products share in the electricity generation matrix. In this regard, natural gas and renewable energy present interesting complementary potential in their joint development towards the design of a cleaner energy mix.

The electricity sector presents the highest demand for natural gas in the region and it is expected to keep its great dynamics in the future.

Chile, Brazil and Uruguay show the greatest development in, and the most outstanding cases of, renewable energy growth. The governments of these three countries have played a strong role in encouraging the development of the renewables through the application of adequate incentives, annual wind and solar energy bidding processes have been conducted and there have also been high levels of acceptance by the private sector in investing in this development. More recently, Argentina announced its first Renewable Energies Public Bidding Process in May 2016, looking to auction 1 GW of renewable energy generation. At pretime winning bids were due to be announced.

LNG imports have become a reality in the Southern Cone and they are expected to grow, mainly to serve the electricity sector.

Finally, natural gas plays an unavoidably leading role as its environmental impact is much lower than other fuels: it releases half as much CO₂ as coal, for instance, and contributes to improve the quality of life of the growing world population, especially in cities, with lower impact on air quality and thus on health.

Natural gas will increase its share in the worldwide and regional energy matrix, which entails a great deal of challenges to be addressed by the region’s countries and companies. This requires the building of mutual trust to consolidate business integration, conduct multilateral work towards the harmonisation of regulations and embrace a comprehensive vision of energy investments from a regional perspective, within the framework of a global social and environmental system.

**Javier Gremes Cordero is CEO of Transportadora de Gas del Sur S.A. (TGS) and IGU Regional Coordinator for Latin America and the Caribbean.**
“Different Folks, Different Strokes”
By Marcel Kramer

This common expression comes to mind when one attends international energy industry meetings and sees the diversity in the concerns and approaches.

While we all share the goal of furthering and promoting our business, our national and regional markets, their structures and policies drive us to take different angles around the globe. State involvement and shareholding, regulatory goals, views on diversification, transparency and competition do vary quite a bit. Economic policies are difficult to merge into a global standard, as people at institutions such as the OECD know all too well.

In recent months I have had several opportunities to hear from energy industry executives in different parts of the world what is important to them. What struck me is that among the few common themes, such as the impact of lower prices and of renewable sources, as well as the inherent unpredictability of the impact of large new LNG flows, one theme was almost universally present: it is the concern about the availability of well-trained and versatile new leaders at various levels in the companies. The energy industry has vast opportunities – and needs – for development in technical, financial and commercial areas. But it is clear that these can only be captured and met when we invest in the continued development of skills and talents at all levels.

Cost-effective methods of well-targeted training must accompany learning-on-the-job. Networking and knowledge transfer, a basic understanding of ‘how things are done elsewhere, and why’ are needed.

The IGU members have opportunities to be among the enablers of learning and we can thus make a contribution to energy industry progress.

Excellent examples of us taking such an approach are the Youth Events which are coupled with major industry gatherings such as the WGC and the St Petersburg International Gas Conference.

And on October 17, just before the IGU Council meeting in Amsterdam, the Energy Delta Institute and the Royal Dutch Gas Association will hold a Youth Event at which all IGU Regional Coordinators will inform about key gas developments in their region.

There will undoubtedly be many more opportunities to engage with young executives and students who are about to graduate.

I suggest we think about holding events such as the ones in Amsterdam and St Petersburg in other locations, for example in conjunction with Executive Committee or Council meetings. The size and scope of Youth Events may vary by location and should also take into account local interests.

In the end this is all about supporting the insights and development of the next generation of industry leaders. A goal worth pursuing for all of us!

Marcel Kramer is President of the Energy Delta Institute (EDI) and IGU Regional Coordinator for Russia, the Black Sea and Caspian Area.
**Update on the 27th World Gas Conference**

By Jay Copan

Planning is well under way for the 27th World Gas Conference (WGC), to be held from June 25-29, 2018 at the Walter E. Washington Convention Center in Washington DC. Under the direction of the National Organising Committee (NOC), chaired by Dave McCurdy, President and CEO of the American Gas Association (AGA), and working closely with the IGU Secretariat, the WGC team, led by IGU President David Carroll, is developing a market-based programme for the event, recognising all of the key issues and opportunities facing the global gas industry over the coming years. With the support of the 1,000 member IGU committee network the team is preparing the most timely and topical programme ever conducted in a WGC – a programme that will focus on three key areas – Access, Markets and Social Licence.

The 27th WGC will be the first to take advantage of the sharply increased IGU focus on advocacy on behalf of the global gas industry. The active role that IGU has played in events such as COP 21 in Paris and the recent G20 meeting in Beijing, means that policymakers are significantly more engaged with IGU than has been the case in the past. And these policymakers, along with a wide range of other constituencies, will play a significantly greater role at WGC 2018 than has occurred in the past.

Indeed, WGC 2018 will engage a very wide variety of constituencies as part of the programme and exhibition. For example, just some of these groups include:

- WGC 2018 is currently engaged with the 177 resident embassies in the Washington DC area, through our Global Ambassadors Network. The Italian Embassy is hosting a very special event for the Washington DC diplomatic corps and other key industry leaders and policymakers on November 1, 2016, that will focus on the growing opportunities for the global gas industry.

- The first ever WGC Financial Advisory Board (FAB) has been formed, under the leadership of Bill White of Lazard Houston, and Steven Miles of BakerBotts. Fourteen leading financial institutions across the globe are represented on the FAB. They are: Standard Bank; US Capital Advisors; Sumitomo Mitsui Banking Corporation; Citigroup; Moody’s Investors Service; The World Bank: International Finance Corporation; Societe Generale; Japan Bank for International Cooperation; Macquarie; Evercore ISI; JPMorgan; Edward Jones and Mubadala Development Company. Within this diverse group of global institutions are
Update on the 27th World Gas Conference

Jay Copan is Executive Director, WGC 2018, and serves as the Special Advisor to the President of the International Gas Union.
What is the impact of the current structural changes in the oil and gas industry on gas operations? How can technology contribute to reducing costs and bring competitiveness to companies in a low oil price scenario? In what way can initiatives in research, development and innovation contribute to the industry’s sustainability in a renewed market context? Moreover, and most importantly, how can natural gas make this transition for the use of renewable energies, becoming the energy source that will be the fuel of the future for all societies?

The 2017 edition of the International Gas Research Conference (IGRC) will shed light on this important discussion, under its main theme ‘Natural Gas: Catalysing the Future’. The motto was chosen to reinforce the questions raised and will provide a deep reflection about the future of the natural gas industry, one in which gas companies will need to redefine their models, methods, products and most significantly to become even more competitive through cost reductions and with the help of technology.

As a result of the COP 21 climate conference held in Paris last year, an impressive number of countries committed to reduce their greenhouse gas emissions, and natural gas is a fuel well adapted to help them meet their targets. Natural gas infrastructure requires massive investments while consumers are increasingly looking for flexibility and the option to choose their own supplier.

Technology is the key to finding solutions to overcome the challenges in a new environment, where prices have decreased and the consumer market sees ever-increasing demand. International Energy Agency (IEA) statistics showed a 5.8% increase in gross consumption of natural gas by OECD countries in 2016 compared to 2015.

In Brazil, the discussion is crossing lines, integrating several topics across production, exploration and transportation, among other relevant matters in the gas sector. Profound changes are ongoing in the Brazilian market, as the country’s main oil and gas producing company, Petrobras, is divesting its assets in gas pipeline infrastructure, distribution, gas power generation and regas facilities. This situation will impose changes in the gas regulatory framework in several areas of

By Cynthia Silveira and Jorge Delmonte
the gas value chain, opening opportunities to new investors.

The presalt is creating opportunities and becoming a key exploration frontier – not only for oil reserves but also for natural gas – according to the IEA, Brazil will represent the tenth largest natural gas producing market by 2040. However, the development of this new frontier is imposing technological challenges such as the high contamination levels of carbon in many fields across the country, not to mention several other challenges to monetisation that arise from offshore gas production, but these again can be overcome with technological solutions.

Altogether, Brazilian and foreign markets are searching for answers critical questions set by global society such as finding environmentally-friendly energy sources and utilising gas as a complementary energy to renewable sources.

The IGRC 2017 conference will map out all technology trends as one of the fundamental pillars for industry development. Business leaders from across all sectors of the natural gas business will gather to discuss the most relevant technical topics of the industry.

In a challenging period that is compelling companies to rebuilt strategies, a refreshing point of view is emerging in our industry: gas as a transition fuel to support a low-carbon economy. It would be a catalysing element to the transformed demands in the energy sector – global power consumption is growing rapidly and a lot needs to be done in order to reach the 17% of the world’s population without any access to energy.

New challenges are facing the energy industry, natural gas will have a major role in overcoming these challenges an in contributing towards a sustainable energy future.

IGRC 2017 will be organised by IBP, the Brazilian Petroleum, Gas and Biofuels Institute, under the auspices of IGU, in Rio de Janeiro next May. The event will be the perfect forum to discuss all these questions with the leading experts of the global gas industry. Visit www.igrc2017.com.br for more information.

Hope to see you there!

Cynthia Silveira is Chair of the Brazilian National Organising Committee; Jorge Delmonte is Natural Gas Manager at IBP.

IBP look forward to welcoming delegates to IGRC 2017 in Rio de Janeiro next May to discuss the important role that research and technology can play in shaping our shared energy future.
News from Organisations Affiliated to IGU

This issue we bring you a report from Energy Delta Institute (EDI) on the inaugural Gas meets Wind symposium, further highlighting the possibilities for the convergence of gas and renewables that was a feature of the last issue of International Gas, April-September 2016. We follow this with a preview of the Gas Technology Institute (GTI) conference, CH4 Connections, and they also provide an update on their work on the detection, prevention and mitigation of methane emissions. Pipeline Research Council International (PRCI) reflect on a busy year of growth and change and we conclude with an update on the World LPG Association’s flagship Cooking for Life campaign.

Gas meets Wind: The North Sea as a future powerhouse
By Miralda van Schot

The North Sea is one of Europe’s prominent and promising areas. In the past, the countries surrounding the North Sea were at the heart of scientific, mercantile and artistic transformations that formed the centre of the first truly global empires, as Michael Pye explains in The edge of the world. Similarly, just as the North Sea has taken an important role in shaping our modern world, it will also have a significant stake in the transition of our modern societies towards achieving the climate goals set by COP 21. The North Sea’s attractiveness as an offshore energy powerhouse, including offshore wind and (green) gas, is huge. And extensive integration between the gas and wind sector may offer a sustainable, reliable, affordable and safe energy system, in balance with improved ecosystems.

Cooperation between the offshore gas and wind sector formed a common thread during the Gas meets Wind symposium, initialised by a consortium of parties consisting of Energy Delta Institute (EDI), Energy Valley, TKi Gas, TKi Wind op Zee, Netherlands Wind Energy Association (NWEA) and Netherlands Oil and Gas Exploration and Production Association (Nogepa). These parties joined forces and organised, within the framework of the Dutch EU presidency, the first edition of this international high-profile symposium on offshore collaboration between the most important (energy-related) stakeholders.

The symposium highlighted that representatives from the gas and wind industry are willing to work together. EDI is very pleased that the above-mentioned representatives have joined forces in ratifying and sealing the ‘North Sea Energy Challenge Manifesto’ to realise synergies between operators in the North Sea area and to make the energy transition as sustainable and affordable as possible. Hans Timmers, President of the board of NWEA and Jo Peters, Secretary General of Nogepa are convinced of the bene-
fits joint efforts can yield. Therefore, they have formed a steering committee together with environmental organisation Stichting Natuur & Milieu, the grid operator TenneT and TNO to further investigate joint possibilities. The steering committee operates in close contact with the MVI-E Lab of the Dutch Topsector Energy in which many North Sea region stakeholders will participate, such as fishery, navigation, ports, nature and agriculture.

In its role as an international energy business school, EDI played not only a significant role in bringing the parties together, but prior to the symposium we also gave young professionals the chance to experience the international challenge of cooperation by means of the Serious Policy Game. The game was developed by the Dutch Ministry of Economic Affairs and used in their campaign that ultimately led to the political declaration on North Sea collaboration regarding the development of offshore wind energy. The game consists of six fictional coastal countries that serve to build windmills and interconnections with a specific budget, while keeping in mind the coverage of domestic demand in the period from now until 2050. While results between the groups differed, the main conclusion was that the energy transition in the North Sea accelerates in cases where a crossover of energy modalities and forces are bundled.

Later on, the symposium was kicked-off by the keynote speaker Mark Dierikx, Director-General Energy, Telecommunications and Competition at the Dutch Ministry of Economic Affairs, who gave insights into the political commitment of energy cooperation between North Sea countries. This political commitment was underlined with the ratification of the political declaration on June 6, 2016 stating the beginning of a coordinated approach by the North Sea countries in the field of offshore wind energy, which may ultimately lead to savings of up to €5.1 billion for offshore grid development. Now that a political framework for cooperation in the North Sea region has been laid out, Mark Dierikx was pleased to see that the industry wants to undertake action as well. “We have put regional cooperation high on the political agenda. I therefore welcome the bottom up approach and the initiative of the offshore gas, wind and grid operators, as cooperation of the fossil and renewable world will strengthen the energy transition and create a win-win for all.”
GTI answers the call for action on methane emissions reductions
By Diane Miller
As the demand to mitigate and adapt to climate change has taken centre stage, methane emissions are one of the most discussed issues facing the gas industry today. The US Environmental Protection Agency has proposed regulations for cutting methane emissions from the oil and gas sector by 40%, and communities around the globe need innovative solutions to meet the challenges of a post-COP 21 world.

Balanced perspectives and collaboration at the heart of CH4 Connections conference
GTI’s annual CH4 Connections conference offers a collaborative approach, focusing on the solutions needed to mitigate the impact of methane emissions while providing the public with requisite energy and services. All the leading research experts, policymakers and environmental advocates will come together to discuss what’s new and what’s next in this important environmental area.

Researchers around the world have developed cutting-edge techniques for emissions measurement; gas utilities have implemented new leak detection and prevention strategies; and state regulators have enacted measures to encourage further improvement. CH4 Connections provides a forum for diverse interests to share knowledge and experience.

New two-day seminar: The North Sea as a future powerhouse
As a result of the successful symposium and EDI’s research regarding offshore power-to-gas, EDI is introducing a two-day seminar: ‘North Sea as a future powerhouse’. This seminar is designed with the aim to build bridges between the fossil-energy industry and the offshore-wind sector. In this way, gas and renewables will become wider connected with regard to exchange, storage and transport of energy, which can lead to new initiatives to promote cooperation of gas and wind on the North Sea. The seminar is expected to take place in five cities along the North Sea, starting in winter 2016 until summer 2017. For more information, please follow developments on EDI’s website (www.energydelta.org).

Miralda van Schot is a scientific energy analyst at Energy Delta Institute.
EXECUTING AN INDUSTRY-LEADING LNG PLATFORM

Cheniere Energy, Inc. is a Houston-based energy company developing LNG facilities along the U.S. Gulf Coast at Sabine Pass in Cameron Parish, Louisiana and near Corpus Christi, Texas. Cheniere currently has 7 trains, or approximately 31.5 mtpa, under construction. With train 1 construction nearing completion, the first LNG is expected to be produced and first LNG cargo loaded in late February or March 2016. Cheniere is poised to become one of the top suppliers of LNG on a global basis and is offering remaining volumes on a more customized basis.
from the American Gas Association (AGA) and a panel discussion highlighting international perspectives. You can learn more about the detailed agenda at www.gastechnology.org/CH4.

Past CH4 Connections conferences hosted in The Woodlands, Texas in 2014 and 2015 have received very favourable responses from participants. They featured leading experts interacting with attendees from industry, environmental and government organisations in lively discussion exploring methane emissions from a host of viewpoints.

**Improving methane emissions estimates and quantification**

Working closely with operators and industry stakeholders, GTI is concluding fieldwork collecting and analysing leak data for buried pipes at a host of sites in the US. This high-quality data will improve estimates for activity data and promote the acceptance of new methane emissions quantification methods for compliance with EPA reporting requirements and other regulations under development.

Building on the collaborative approach emphasised in the CH4 Connections conference, GTI is addressing environmental concerns in close partnership with industry, government, researchers, and academia. GTI has engaged with the AGA, EDF and National Institute of Standards and Technology (NIST), seeking their input and review of the data and approaches used to quantify methane emissions.

**Expert viewpoints**

Tisha Shuller, an energy policy thought leader specialising in oil and gas, will be just one of the featured keynote speakers at the event. She works as Strategic Advisor to Stanford University’s Natural Gas Initiative, and speaks around the world on the contentious issues associated with energy development. In addition, Sarah Dunham, the Director of the Environmental Protection Agency’s (EPA) Office of Atmospheric Programs, will join the line-up as another compelling keynote.

Speakers from the Department of Energy (DOE), Environmental Defense Fund (EDF), New York State Public Service Commission (NYPSC), utilities, universities, national labs and others will share their insights along with presentations as they discuss upcoming policy decisions and the newest detection, measurement, and reduction programmes and techniques.

**New location at centre of game-changing methane decision-making**

The 2016 event takes place from November 2-3, 2016 in Washington DC, where speakers will address current research on methane leakage, technologies to detect and reduce emissions, policy and regulatory options, and business implications and opportunities. Two days of peer-reviewed environmental sessions will feature round-table discussion panels and dynamic keynote addresses.

**Tools and technologies for detection, prevention and mitigation**

In the early 2000s, GTI supported development of an innovative portable tool called the Hi Flow Sampler that can rapidly and accurately measure methane leaks – fugitive emissions – from a variety of gas industry equipment. The tool, commercially available from Heath Consultants, is now being used to provide real-time measurements of gas-flow rates and concentrations in a captured enclosure at the surface.
emission factors based on pipe material were developed and utilised to estimate methane emissions at the state level.

The next phase of work will focus on methane emissions from residential customer meters. These studies will provide important information on natural gas leaks from local distribution companies and improve methane emission estimates from this sector.

GTI and team also recently received a $1.1 million DOE contract award to conduct field campaigns to measure methane emissions from new and vintage plastic, plastic-lined steel, and cast-iron pipes, as well as from industrial meters.

Assessments, methodologies and projects

In a California Energy Commission-sponsored project, fugitive emissions from natural gas systems in commercial buildings are being assessed. GTI is developing a methodology for measuring emissions beyond the meter from specific appliances or system components, to help quantify total building emissions. These efforts will help give a holistic picture of the total leakage from natural gas activities in California.

GTI recently completed a project to quantify methane emissions from distribution pipelines in California for the California Air Resources Board and presented results at a joint California Public Utilities Commission/California Energy Commission/California Air Resources Board methane emissions symposium. State-specific emission factors based on pipe material were developed and utilised to estimate methane emissions at the state level.

Improving safety with proactive detection

GTI’s residential methane detector programme focuses on augmenting natural gas safety programmes with early warning systems. A national pilot study to evaluate the performance of methane detectors in residential settings began in April 2016, with 10 utilities deploying about 700 detectors in customers’ homes.

The commercially available detectors being tested performed well under extensive lab testing at GTI, demonstrating their ability to detect natural gas at 10% of the lower explosive limit and illustrating an improved ability to discern between standard household chemicals and natural gas, reducing the likelihood of false positives.

The pilot programme will run approximately 12 months to validate device performance in a...
real-world environment and provide statistical rigour in quantifying performance to provide data for informed decision-making on broader deployment strategies.

In parallel, a consumer behaviour study and revision to applicable UL standards for a lower level of detection are underway. By improving the reliability and increasing the use of residential methane detectors to a point where they are a common household item similar to smoke alarms and carbon monoxide detectors, issues due to unreported or undetected gas leaks can be prevented.

Diane Miller is Senior Marketing Communications Manager at the Gas Technology Institute.

**PRCI Technology Development Center and Research Objectives**
By Cliff Johnson

I remember when I was young and a year seemed to last forever, at the least the school year did. Summertime seemed to flash by before you knew it. Now it seems like life is one quick and eventful summer and that is particularly true for Pipeline Research Council International (PRCI). It has been an amazing year of growth and change at PRCI.

Just last year we opened the new PRCI Technology Development Center (TDC). This is a 3.4-hectare site featuring a 2,787m² research and development centre for PRCI, its members, and the industry. As part of the site we house a pull test facility that currently has three parallel pipe strings with diameters of 12-, 16-, and 24-inch pipes and lengths up to 500 feet. What is unique about these strings is the high density and verity of defects types, both real-world and manufactured, combined with a tool pulling capability that is unmatched in North America.

We have begun utilising the strings to work with our members, including inline inspection (ILI) tool vendors, to enhance the performance of the key tools for ensuring the safety and integrity of pipeline infrastructure. This is a partnership between the operators and the tool providers that is vital to the long-term safe operation of pipeline systems. We have also had usage of the pull test facility by our members and third parties to perform outside testing and validation of the tools. This is a...
A.Hak has been awarded a contract by National Grid to design and build the new Humber pipeline, together with joint venture partners Skanska and PORR Bau GmbH. This high pressure gas pipeline from Paull to Goxhill, within a tunnel underneath the River Humber, will replace the existing pipeline which lies on the riverbed.

Over time, the tidal patterns of the River Humber have eroded the river bed covering the existing pipeline, leading to parts of it being at risk of being exposed. An innovative short-term engineering solution to protect the pipeline by covering exposed areas was put in place in 2010. Because of the importance of the pipeline, National Grid is now looking to construct a new pipeline in a tunnel underneath the river, as a long-term replacement.

Phil Croft, National Grid’s senior project manager said: “This pipeline will be the longest gas pipeline in a tunnel in the world, inserted in a single string. To do this we need partners with experience and a proven track record. A.Hak, Skanska and PORR were able to demonstrate their expertise and knowledge throughout the tender process, giving us the confidence that they were the right partners to build this tunnel and pipeline in such an environmentally sensitive and commercially busy river.”

On behalf of the joint venture, Colin Nicol, Operations Director, Skanska said: “We are delighted to be awarded this contract. The joint venture was formed to bring together international expertise to deliver, in an innovative, sustainable and collaborative way, a tunnel that will protect the pipeline for the long term.”

The three year project is estimated to cost around £150 million, in which the joint venture will provide full design and construction of the 5km tunnel, inserting a single string of 42” steel pipe and connect into the above ground installations at Paull and Goxhill.

The River Humber pipeline is part of the national transmission system of the United Kingdom – connecting the import terminal at Easington, on the East Yorkshire coast, to the wider network and delivering gas to millions of customers throughout the UK.
The first of three pipe flow loops planned for the Center entered service this year, enabling both subsea pipeline and enhanced leak detection research to be undertaken.

The first of three strings loops have been completed at the 6-inch diameter. We are working to complete the 8- and 10-inch loops by the second quarter of 2017. These new assets will enable PRCI to expand our research at the TDC to include subsea pipeline systems as well. We are also looking at the loops to provide PRCI with the opportunity to enhance our work in the leak detection area.

The TDC continues to grow and flourish based on our members needs and direction. The site gives PRCI an opportunity to move aggressively to pursue key developments and enhancements for our members and the industry.

In the last year, we have also defined the key research objectives (RO) for our members. The RO are the cornerstone of our research programme and will provide focus on the key items needed by our members. The following are the RO:

- Develop and/or validate technology and analytical processes that are capable of characterising pipeline material properties with sufficient accuracy for application in pipeline integrity assessments.
- Develop and enhance ILI technology to reliably detect, size and characterise indications that may be harmful to the integrity of the pipeline.
- Develop, evaluate and enhance non-
Fluxys as a gas infrastructure company seeks to foster the integration of the European gas market through the development of a cross-border infrastructure backbone linking gas sources to markets, bridging the markets and gas trading places, and providing security of supply.

Fluxys is convinced that gas and gas infrastructure will continue to feature as core components of an affordable energy mix for tomorrow’s low-carbon economy.

- Gas is the cleanest fossil fuel with the lowest carbon footprint and the lowest emissions impacting health.
- Gas infrastructure and gas-fired power plants provide the flexibility required to complement variable power generation from renewable sources.
- Gas infrastructure is a highly versatile asset for transmission and storage of large quantities of energy at low cost. New technologies such as power-to-gas will make the gas system even more flexible in the future energy landscape.
developing, demonstrating and validating processes and technologies to detect, locate, measure, quantify and mitigate such releases.

- Enhance operational efficiency, flexibility, and availability including measurement functionality¹, accuracy, characterisation of flows and custody transfer at all points in production and delivery infrastructure including liquid pumping and gas compressor stations and all storage systems.

As we look back on the last year and prepare for 2017, it is amazing to see how much we have undertaken and how fast the year has gone. We know that time waits for no one and as we move into 2017, we know that it is shaping up to be another huge year for PRCI and our members. PRCI will continue to push to deliver relevant and innovative applied research for the safe operation of energy pipelines.

Cliff Johnson is President of Pipeline Research Council International.

Cooking for Life – A flagship campaign for the World LPG Association
By Alison Abbott

Each year, 4.3 million people die from cooking-related Household Air Pollution (HAP)-caused illness – more than deaths from malaria, HIV/AIDS and tuberculosis combined.

Every morning in cities and rural areas across the world, a woman starts a fire to cook for her family using solid fuel. This daily ritual is meant to nurture and sustain families, instead it is harming them. Burning solid fuels releases soot into the air, causing respiratory infections, pulmonary disease, lung cancer, malnutrition, low birth weight and other conditions. Three billion people – largely the world’s most vulnerable and poor – breathe in this deadly air. Indoor smoke from solid fuels

¹ Functionality includes proper operation reliability and repeatability of measurements.
THE FUTURE OF GREEN ENERGY IS IN SAFE HANDS

Natural Gas is emerging as the fuel of the 21st century, steadily replacing liquid fuels and coal due to its low ecological footprint and inherent advantages for all user segments: Industries-Transport-Households.

Indian Oil Corporation Ltd. (IndianOil), India’s downstream petroleum major, proactively took up marketing of natural gas over a decade ago through its joint venture, Petronet LNG Ltd., that has set up two LNG (Liquefied Natural Gas) import terminals at Dahej and Kochi on the west coast of India.

Over the years, the Corporation has rapidly expanded its customer base of gas-users by leveraging its proven marketing expertise in liquid fuels and its countrywide reach.

Its innovative ‘LNG at the doorstep’ initiative is highly popular with bulk consumers located away from pipelines. IndianOil is now importing more quantities of LNG directly to meet the increasing domestic demand. It is also setting up its own 5 million tonnes per annum LNG import terminal at Ennore, near Chennai on the east coast, to be operational by 2018.

The Corporation has formed two joint ventures to enter the burgeoning city gas distribution segment through Piped Natural Gas (PNG) networks that are coming up in many urban centres. IndianOil is also adding compressed natural gas (CNG) as a green auto-fuel at its 25,000+ fuel stations across India. Yet another joint venture of the Corporation is investing in cross-country natural gas pipelines.

IndianOil is committed to energising the future, naturally through Gas

- Petroleum Refining & Marketing
- Pipelines Transportation
- Research & Development
- Technology Solutions
- Petrochemicals
- Gas Marketing
- Exploration & Production
- Alternative Energy (Biofuels, Wind & Solar)
- Explosives & Cryogenics

www.iocl.com /IndianOilCorpLimited /IndianOilcl /IndianOilcorporationlimited /Indianoilcorp
Cooking for Life was created by WLPGA and launched in 2012. Cooking for Life aims to transition one billion people from cooking with dirty and dangerous fuels such as various forms of biomass, dung and kerosene collectively known as ‘traditional fuels’ to cleaner burning LPG by 2030. In turn this will prevent some 500,000 premature deaths per year, primarily women and children from exposure to household air pollution. Quantitative studies of the socioeconomic impact of household energy interventions in developing countries carried out in recent years suggest that the socioeconomic gains from switching to LPG are significant and this shift will have the economic and social benefits of lifting millions out of the poverty trap to save lives, improve health, empower women and preserve the environment.

To achieve these ambitious targets, Cooking for Life mobilises support from a wide range of stakeholders, including the LPG industry itself, non-profit organisations and governments to create the policies and infrastructure needed to expand LPG use. The campaign convenes governments, public health officials, the energy industry and global NGOs to expand access to LPG and bring this modern alternative to the people who need it most. Cooking for Life also works to increase public awareness about how traditional fuels negatively affect everyday life among the world’s most vulnerable.

The specific goals of the campaign are to demonstrate the benefits of LPG to policymakers and opinion leaders in the context of development: health, economic advancement, women’s empowerment and education and the environment; to enable WLPGA member companies, policymakers, governments and development agencies to serve as channels to reach consumers about the benefits of LPG; to demonstrate the benefits of LPG as a cooking fuel to women, stressing the convenience, modernity and health benefits; and to promote the expansion of LPG demand and usage in...
developing markets by working with governments and development agencies. Cooking for Life puts the necessary tools and resources for success in the hands of energy policy decision-makers in developing countries. India, Brazil and Indonesia are shining examples of successful countrywide conversion to LPG, proving that large-scale adoption is possible. The campaign arms leaders in other countries with the best practices and lessons for implementing successful LPG conversion programmes.

The WLPGA has produced a wealth of reports looking at the impact of substituting LPG for traditional fuels on the lives of children, of women, the socioeconomic impact and also other issues such as deforestation. Two hundred and forty million households converting to LPG could save 23,700 km² of forest, in other words 46% of annual net global deforestation. A developing world household consumes two tonnes of wood per year which is the equivalent of approximately 10 trees. The shift by 2015 of 445 million people from wood to LPG would spare 4,4000 km² of forest a year. By 2030, with over a billion people switched to LPG, a staggering 12,000 km² per year would be saved which is equivalent to nearly one-quarter of current global deforestation.

WLPGA has also produced an industry good-guidelines report which covered the conversion of institutional kitchens to LPG to be made available for schools, orphanages, hospitals, prisons and other establishments. The purpose of the guidelines was to provide materials to assist in convincing stakeholders to initiate the switch and to provide educators with a toolkit to explain the very distinct benefits of LPG.

In 2016, Cooking for Life is working with the UN High Commission on Refugees (UNHCR) to create a new WLPGA Good Industry Practices Guidelines on the safe use of LPG in humanitarian settings. This will be meant as a technical manual to be used by aid professionals for sourcing, storing, deploying, installing and using and maintaining LPG in a humanitarian context such as refugee camps, emergency rapid response units, field hospitals and kitchens, etc. This takes into account the fact that today there are more people living in refugee camps than at any time since the end of World War II and that the average refugee spends 18 years in camps before being resettled permanently. Providing them with clean energy is of paramount importance.

Cooking for Life strongly supports other global initiatives such as the GiveItUp Campaign in India. GiveItUp is a scheme launched by the Indian government in 2015 that asks wealthy Indians to voluntarily give up their LPG subsidy so that less fortunate households that are truly in need may benefit. As of April 2016 over ten million Indian households had voluntarily given up their LPG subsidy so that less fortunate compatriots could benefit. A case study on this initiative can also be found on the Cooking for Life website.

All of the above reports are freely available for download at www.cooking-for-life.org or please contact Michael Kelly (mkelly@wlpga.org).

Alison Abbott is Communications Director at WLPGA.
It was said that bringing gas from Camisea was almost impossible.

It’s been 10 years that we’ve been transporting gas from the jungle to the coast, traveling across all the varieties of climates and geographies Peru has.

A challenge is judged by its results.
Focus on the work of IGU’s Committees and Task Forces

As the triennial work programme reaches its midpoint under the presidency of the United States we bring you some of the latest work produced by the IGU committees and task forces and their dedicated expert members.

Following an introduction highlighting recent changes in the Coordination Committee, some of the latest IGU publications that have been released and the 2016 IGU Human Capital Survey, we lead with an article about the Marketing and Communications committee’s ongoing and very well received Webcast Live… series of interviews and discussions.

The Utilisation committee share a paper on power generation in natural gas pressure reduction stations of compressor stations while the Strategy committee discusses gas price convergence in the last decade, its findings, from work undertaken in collaboration with the Energy Delta Institute, run contrary to conventional wisdom.

The final two articles in the section come from the Distribution committee, on elevating customer experience through customer feedback, and, on behalf of the R&D and Innovation committee, a paper on remote subsea pipeline repair technology jointly developed by Statoil and Gassco.
As the IGU committees are moving into their third round of meetings, we are half way into the triennium. All committees are progressing well with their work and have started to prepare for the WGC 2018 Call for Papers to be issued in April 2017.

**Changes in organisation**
The Coordination Committee leadership team has a new face on board. After Mel Ydreos assumed the position of IGU’s Executive Director of Public Affairs, Rod Rinholm joined the team as Acting Coordination Committee (CC) Chair. Mel is still formally CC Chair, but Rod is taking care of the day-to-day activities of the Coordination Committee. This is of particular importance as preparations continue for WGC 2018 in Washington DC. As an experienced executive with considerable international experience and participation in many IGU-related activities, Rod is well known to the committees and IGU. He was appointed in June and has used this time to get to know the committee chairs and the committee work.
Europe and LNG imports were more than offset by domestic pricing reforms in China. With the advent of US LNG exports and the current surplus of LNG, more changes in pricing mechanisms are expected over the next few years.

If you haven’t read it yet, the report is available at www.igu.org. This magazine also features an article summarising the findings.

2016 IGU Human Capital Survey

The IGU Task Force, Workforce Development has invited human resources professionals to participate in the 2016 IGU Human Capital Survey – the first step in a three-year integrated project that will be carried out during the current IGU Triennium. The aim is to deliver a strategic response to the challenges of attracting, developing and retaining talent for the global gas industry. The survey results will be complemented with interviews of senior industry experts, interviews with young professionals from the gas industry, and company HR best practice examples.

If you would like to learn more about IGU committee work, please consult the Triennial Work Program 2015-2018 at www.igu.org or send an email to Anette Sørum Nordal, Coordination Committee Secretary who can be reached via www.igu.org/contact.
The IGU webcast series, expanding global gas advocacy

By Dimitri Schildmeijer and Anette Sørum Nordal

With the IGU Webcast Live from Berlin, the IGU Marketing and Communications committee launched IGU’s new webcast series on Thursday 25 February. The webcast series is hosted by Hansch van der Velden, Vice President of Corporate Communications at Gasunie and Dimitri Schildmeijer, Managing Director at AudienceOne. Both are members of IGU’s Marketing and Communication Committee.

The series aims to feature the players and issues that really matter to the natural gas industry. This first webcast included the following three guests: Pål Rasmussen, IGU Secretary General; Marcel Hoenderdos, Manager Communications at the Dutch State participation company EBN; and Alex Burnett, Chair of the IGU Strategic Communications and Outreach Taskforce.

Pål Rasmussen: clean air is a key advocacy point

Pål was the honorary first guest and opened his remarks by indicating that the global primary energy market share of natural gas has grown over the last year – after being flat for some years. He also noted that all current forecast scenarios point to increased use of gas well into the future. Pål sees more and more signals that natural gas and renewables are indeed complementary partners.

Then Pål spoke about the IGU’s launch of the advocacy campaign on clean air at the COP 21 UN climate conference. The launch included IGU’s release of the report Case Studies in Improving Air Quality. The report gained global media coverage including a timely and relevant coverage during COP 21 in The Financial Times.

“Urban air quality and the role of gas will remain high on the IGU agenda for 2016” Pål said. He stated that IGU has received interest from both the G20 and the IEA to advance work to deal with this very real and critical issue.

Marcel Hoenderdos: move to gas by design, not gas by default

Marcel Hoenderdos is a new member of the IGU. He is a champion for the new Dutch ‘Guild’ (or G.I.L.D.E. in Dutch). The Guild engages NGOs including Nature & Environment, Greenpeace and Friends of the Earth NL. The initiative is particularly important at a time when the Netherlands has experienced a dramatic drop in the perception of natural gas due to concerns over shale exploration and earthquakes.

GILDE is a collaborative platform that allows the industry and stakeholders outside the gas industry to work together, as a group, on “What is the role of gas in a long-term sustainable energy future?” The question mark at the end of this sentence, Marcel explained, ensures an open dialogue. It emphasises the importance of NGOs and other stakeholders to help shape the proposition of gas. “We believe the role of gas moves from ‘Gas by Default’ to ‘Gas by Design’”, he stated. And when asked whether that means in some cases you pack up and go when there is no role for gas, Marcel said “That might well be the case in some situations – but from an overall energy perspective and in the long run, gas is necessary.”

Alex Burnett: IGU to step up efforts on being a global voice of gas

Alex Burnett was the last guest. He is the Chair the IGU Strategic Communications and Outreach Taskforce. His task force aims to guide
and provide advice to the IGU to raise the
global voice of gas and efficiently advocate for
gas. Alex stated that it is more than ever
important that we provide a strong global
message on gas. “In many parts of the world,
growing or sustaining the role of natural gas
will increasingly depend on the emergence of
favourable policy frameworks that recognise its
many advantages. Likewise, capital allocation in
our industry will be shaped by investors’
perceptions of the sustainability of that policy
support. So it’s more important than ever that
we have a strong global voice making the case
for gas. With a renewed focus on advocacy and
communications, the IGU has to clearly arti-
culate the role that gas can play in providing
secure, economic, environmentally and socially
sustainable energy.”

Alex also stressed the importance for IGU to
have adequate resources to expand its activities
in advocacy. Finally, Alex made a point of the
importance of the work of the committees in
developing the IGU’s global voice for gas.

**IGU Webcast Live from Amsterdam**

At presstime the next edition of the series is
scheduled to take place in Amsterdam, live via
video stream, on October 18, 2016. The web-
cast will cover the theme clean air and the role
of natural gas in a sustainable energy future,
and the three invited guests are:

- **Tjerk Wagenaar**, Director of Nature &
  Environment, a leading Dutch NGO: On the
  role of gas in a sustainable energy future.
- **Mel Ydreos**, Executive Director Public Affairs,
  IGU: On the clean air debate and the role
  of gas.
- **Coby van der Linde**, Director, Clingendael
  International Energy Programme (CIEP): On
  the impact of clean air policies on natural
  gas and the importance of a multi-stakeholder
  approach for a sustainable energy mix.

We look forward to bringing you updates
on the series in future editions of the maga-
zine and reporting on the important points
raised during the broadcasts which form an
important part of IGU’s ongoing global gas
advocacy strategy.

Dimtiri Schildmeijer is Managing Director at
AudienceOne and a member of the IGU
Marketing and Communications Committee.
Anette Sørum Nordal is IGU Coordination
Committee Secretary.

The IGU Webcast
Live from Amsterdam
will be streamed online
from the Movenpick Hotel
Amsterdam City Centre as
part of the IGU Autumn
meetings programme.
In natural gas transmission systems, compressor stations increase natural gas flowing in pipelines. Wherever there is an end user for natural gas its pressure should be reduced to satisfy their needs. The traditional method for reducing natural gas pressure is to utilise expansion. But there is another newer and more modern method: to utilise turboexpanders. Through this method natural gas is not only expanded and its pressure regulated, but also mechanical power can be produced on the turboexpander’s output shaft which can be converted to electricity via a generator. This paper focuses on natural gas pressure reduction stations (GPRS) of compressor stations. The results show the amount of the fuel saving using turboexpanders.

Technical background
Pressure regulators are widely used in both commercial and residential applications to control the operational pressure of gas. Their task is to reduce a supply pressure to a lower outlet pressure and this reduction is their key characteristic. A pressure regulator is a valve that automatically cuts off the flow of a liquid or gas at a certain pressure. They are used to allow high-pressure fluid supply lines or tanks to be reduced to safe and/or usable pressures for various applications.

When choosing a pressure regulator many factors must be considered. Important considerations include: operating pressure ranges for the inlet and outlet, flow requirements, the fluid, expected operating temperature range, material selection for the regulator components including seals, as well as size and weight constraints.

This reduction of the inlet pressure to a lower outlet pressure leads to a significant reduction of the gas temperature. A water bath heater is used for heating the natural gas and regulating the temperature. It consists of furnace body, burner, smoke fire pipe, heating coiler, chimney, control system and fuel supply system, including an inlet stop valve and regulator. Also, it can be designed with a filter and heater to meet different site conditions. The basic working principle is that water is heated by fuel gas inside the furnace and then the hot water exchanges its heat with the natural gas via a heating coiler.

In natural gas transmission systems, there are compressor stations which their duty is to increase natural gas flowing in pipelines. This increase firstly compensates natural gas pressure loss and secondly provides the natural gas required mass flow at any specific point in the network. Wherever there is an end user for natural gas, its pressure should be reduced to satisfy their needs. This demand can be household, industry, power plant or a compressor station itself needing fuel gas for turbo compressors.

The traditional method for reducing natural gas pressure is to utilise expansion or Joule-Thomson valves or regulators as described above. But there is another newer and more modern method: to utilise turboexpanders. This way natural gas is not only expanded and its pressure regulated, but mechanical power can be produced on the turboexpander output shaft which can be converted to electricity via a generator.

This article focuses on natural gas pressure reduction stations in compressor stations. Regular compressor stations utilise turbo-compressors driven by gas turbines. Each gas
Stream and converting the energy released into mechanical work, which in turn can be utilised for mechanical drive applications (as a pump or compressor driver) or power generation applications (connecting to a generator).

As the gas or vapour stream is highly chilled during the expansion process in a turboexpander, sometimes chilling a stream becomes the main reason to utilise a turboexpander and hence the mechanical work produced will be a byproduct in this situation.

Turboexpanders have been widely used in cryogenic applications. This is mainly due to the characteristic chilling they provide. They are also becoming increasingly popular for power recovery from a hot gas or vapour stream. Our project focuses on another popular use, natural gas pressure reduction/letdown stations. A schematic view of this use is shown in Figure 2 overleaf.

The difference between the operations of an expansion valve or a regulator and a turboexpander is the thermodynamic process that gas follows when the gas stream flows through them. These processes are presented in the temperature-enthalpy (T-s) diagram, Figure 3 overleaf. The thermodynamic process of an expansion valve is along the constant enthalpy line as it is assumed that in an expansion valve there is no change of enthalpy. On the other hand, a turboexpander is a turbine. The reason to designate a specific name for them and to distinguish them from steam turbines and gas turbines is their particular applications. Their operating concept is exactly similar to that of other turbines; they utilise pressure energy of a gas or vapour stream through expanding that stream and converting the energy released into mechanical work, which in turn can be utilised for mechanical drive applications (as a pump or compressor driver) or power generation applications (connecting to a generator).

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As the gas or vapour stream is highly chilled during the expansion process in a turboexpander, sometimes chilling a stream becomes the main reason to utilise a turboexpander and hence the mechanical work produced will be a byproduct in this situation.

Turboexpanders have been widely used in cryogenic applications. This is mainly due to the characteristic chilling they provide. They are also becoming increasingly popular for power recovery from a hot gas or vapour stream. Our project focuses on another popular use, natural gas pressure reduction/letdown stations. A schematic view of this use is shown in Figure 2 overleaf.

The difference between the operations of an expansion valve or a regulator and a turboexpander is the thermodynamic process that gas follows when the gas stream flows through them. These processes are presented in the temperature-enthalpy (T-s) diagram, Figure 3 overleaf. The thermodynamic process of an expansion valve is along the constant enthalpy line as it is assumed that in an expansion valve there is no change of enthalpy. On the other hand, a turboexpander is a turbine. The reason to designate a specific name for them and to distinguish them from steam turbines and gas turbines is their particular applications. Their operating concept is exactly similar to that of other turbines; they utilise pressure energy of a gas or vapour stream through expanding that stream and converting the energy released into mechanical work, which in turn can be utilised for mechanical drive applications (as a pump or compressor driver) or power generation applications (connecting to a generator).
Turboexpander in natural gas pressure letdown service (a power recovery cycle)\(^1\)

![Diagram of turboexpander in natural gas pressure letdown service](image)

hand, the gas or vapour stream moves along a polytropic process and as there is an enthalpy change, mechanical work can be produced by the turboexpander.

It is concluded from the T-s diagram (Figure 3) that given the same inlet conditions, the temperature of the stream leaving the turboexpander is lower than that leaving an expansion valve. As a general rule of thumb it is proposed that for a 1 MPa reduction in gas stream pressure, its temperature will decrease 4-6°C when the gas is expanded in an expansion valve. The same reduction in pressure through a turboexpander will lead to a temperature decrease of 15-20°C. This feature is very important as a high chilling of the gas stream in the turboexpander can lead to very low temperatures not allowable for the specific gas (because of droplet formation, for example).

As a result, there may be a requirement for pre-heating the gas stream before it enters the turboexpander.

The most common type of heaters used in a natural gas pressure reduction station are water bath heaters. These are an excellent form of indirect heating, efficiently transferring energy to process media. Temperature ranges for the process media and bath fluid are typically lower than those used in other heaters.

The heat transfer media is usually a mixture of water and glycol. Water bath heaters can be utilised as natural draft or forced draft. Typical

---

**Figure 2.**

**Figure 3.**

Expansion in expansion valves and turboexpanders

![Diagram of expansion in expansion valves and turboexpanders](image)
As of 31st December 2015, there is an estimated total of 3,535 million BOE of proven hydrocarbon reserves, of which Natural Gas and associated NGLs make up the largest volume.

Various oil and gas reserves discovered last decade are still yet to begin production.

It is estimated that the Gas and NGL reserves discovered to date are approximately half of the total potential.

A FRESH START: A RENEWED STRATEGIC FRAMEWORK FOR PERUVIAN HYDROCARBONS IS CLOSE
efficiency of water bath heaters is 70-75% for natural draft and 80-85% for forced draft.

A water bath heater’s principle of operation is as follows: the burner fires into a submerged fire-tube, located at the bottom of the bath heater shell. Energy is transferred through the fire-tube wall to the surrounding bath fluid (heat transfer media). The bath fluid transfers the required amount of energy into a series of process coils located at the top of the heater shell by means of natural convection.

Water bath heaters are typically atmospheric, with an expansion tank located on top to compensate for the change in bath fluid density with varying bath temperatures. Process bath heaters have few moving parts, require very little maintenance, and can achieve an efficiency of 80% without the use of an economiser. An example of a natural draft water bath heater is shown in Figure 4.

**Compressor station data**

<table>
<thead>
<tr>
<th>Nominal capacity</th>
<th>Inlet pressure</th>
<th>Exit pressure</th>
<th>Height</th>
<th>Gas turbine type</th>
<th>Arrangement</th>
<th>Gas turbine fuel gas pressure</th>
<th>Gas turbine fuel gas temperature</th>
</tr>
</thead>
<tbody>
<tr>
<td>91.7 Mm³/d</td>
<td>49 bar</td>
<td>73 bar</td>
<td>1519 m</td>
<td>M5238C</td>
<td>3+1</td>
<td>19 bar</td>
<td>25°C</td>
</tr>
</tbody>
</table>

**Compressor station simulation results**

<table>
<thead>
<tr>
<th>Each gas turbine power generation</th>
<th>Each gas turbine load</th>
<th>Each gas turbine efficiency</th>
<th>Each gas turbine fuel consumption</th>
<th>Total fuel consumption / Turboexpander flow</th>
</tr>
</thead>
<tbody>
<tr>
<td>23,000 kW</td>
<td>100%</td>
<td>28.86%</td>
<td>1.773 kg/s</td>
<td>5.319 kg/s</td>
</tr>
</tbody>
</table>
Sample station data
Data for a sample compressor station are presented in Table 1, the schematic view of this station as simulated is shown in Figure 5 and simulation results are included in Table 2.

Compressor station electrical network data
Generally ‘self-generation’ refers to distributed generation technologies (micro-turbines, small gas turbines, wind turbines, photovoltaic systems, fuel cells and internal combustion engines), installed on the customer’s side of the utility meter that provide electricity for either a portion or all of that customer’s electric load. In this regard, turboexpanders represent a ‘super clean’ resource of self-generation because there are no emissions resulting from the pressure drop that enables the technology to produce electrical power. However, in some references, as turboexpander generation relies on fossil fuel inputs, this technology does not qualify as super clean or renewable.
Power generation calculations

To gain a better understanding of turboexpander performance and design features a primary estimation of its speed and efficiency is made and presented. This estimation has been performed based on procedures and diagrams provided by leading turboexpander vendors. The iterative procedure of efficiency estimation is shown in the flowchart Figure 6. The procedure should be continued until the difference between the new and old values for the efficiency becomes less than a specified tolerance.

It should be noted that in determining the turboexpander type (Figure 7), for turboexpander specific speed values between 20 and 140, the radial inflow type is recommended from an economic point of view. Figure 8 overleaf determines the maximum allowable turboexpander speed. For higher values of specific speed it can be more economical to reduce the speed; this way the specific speed is also reduced and using a radial inflow turboexpander becomes feasible again.

The results of preceding calculations are presented for the sample station as

The sample station is equipped with a 20 kV to 400 V substation to supply electricity to the station from the national electricity grid. It is fully compatible with the goals of this project since the voltage requirement of turboexpanders in the range we are discussing is also 400 V.
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follows. Besides the values of power generation and heat consumption which are presented, a thermal efficiency is defined according to the first law of thermodynamics which is the ratio of generated electrical power to pre-heater input heat. The required process inputs of the sample station are also included.

A summary of the sample station input data and results of calculations are presented in Table 3.

**Estimation of total fuel saving potential**
The power generated by turboexpanders means that some power is being added to the electricity network without consuming fuel in

---

### Sample station input data and results

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Symbol</th>
<th>Unit</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Station / Turboexpander Inlet Pressure</td>
<td>$P_1$</td>
<td>bar</td>
<td>49</td>
</tr>
<tr>
<td>Station / Pre-heater Inlet Temperature</td>
<td>$T_0$</td>
<td>°C</td>
<td>24</td>
</tr>
<tr>
<td>Pre-heater Exit / Turboexpander Inlet Temperature</td>
<td>$T_1$</td>
<td>°C</td>
<td>75.7</td>
</tr>
<tr>
<td>Gas Turbines Fuel / Turboexpander Flow</td>
<td>$m_f$</td>
<td>kg/s</td>
<td>5.319</td>
</tr>
<tr>
<td>Gas Turbines Fuel / Turboexpander Discharge Pressure</td>
<td>$P_2$</td>
<td>bar</td>
<td>19</td>
</tr>
<tr>
<td>Gas Turbines Fuel / Turboexpander Discharge Temperature</td>
<td>$T_2$</td>
<td>°C</td>
<td>25</td>
</tr>
<tr>
<td>Required Input Heat to Gas</td>
<td>$Q_0$</td>
<td>kW</td>
<td>706</td>
</tr>
<tr>
<td>Input Heat Considering Pre-heater Efficiency</td>
<td>$Q$</td>
<td>kW</td>
<td>1008.6</td>
</tr>
<tr>
<td>Turboexpander Speed</td>
<td>$N$</td>
<td>rpm</td>
<td>32214</td>
</tr>
<tr>
<td>Turboexpander Specific Speed</td>
<td>$N_{sp}$</td>
<td>–</td>
<td>37.77</td>
</tr>
<tr>
<td>Turboexpander Efficiency</td>
<td>$\eta_{te}$</td>
<td>%</td>
<td>78.1</td>
</tr>
<tr>
<td>Electrical Power Generation</td>
<td>$W$</td>
<td>kW</td>
<td>528.6</td>
</tr>
<tr>
<td>First-Law Thermal Efficiency</td>
<td>$\eta_{th}$</td>
<td>%</td>
<td>52.41</td>
</tr>
</tbody>
</table>
The fuel consumption of water bath pre-heaters is calculated based on minimum water bath heater efficiency (70%) as explained previously in the technical background. For electrical heaters, an efficiency of 90% is considered. In summary, to calculate the equivalent fuel consumption of heaters:

- For water bath heaters:
  1. Divide \( Q_0 \) by 0.7
  2. Divide the result of 1 by LHV

- For electrical heaters:
  1. Divide \( Q_0 \) by 0.9
  2. Divide the result of 1 by 0.31
  3. Divide the result of 2 by LHV

The amount of heat needed for gas pressure reduction in a turboexpander case or expansion valve/regulator case together with power generated in the turboexpander is summarised in Table 4. It should be noted that heater efficiency is not considered in this table and the calculations for fuel consumption are to be performed as described above.

The fuel consumption for generating equivalent turboexpander electrical power in power plants together with fuel consumption in its pre-heater is presented in Table 5. For the expansion valve or regulator case there

```
Turboexpander Water bath heater
Equivalent power fuel saving (kg/s)  Equivalent heat fuel consumption (kg/s)
0.034071199  0.020152485
```

Table 5.
is only fuel consumption in pre-heaters (two types considered) and the data is given in Table 6. The reduction of fuel consumption is calculated for the sample station and presented in Table 7 according to the following formula:

\[
\text{Fuel saving} = \left( \text{Turboexpander fuel saving; Table 5} \right) - \left( \text{Expansion valve or regulator heater fuel consumption; Table 6} \right)
\]

Therefore, the total fuel saving in the sample station will be 2,488 standard cubic metres per day (SCMD) for the water bath heater case (in the current situation) and 3,903 SCMD for the electrical heater case (in the current situation). This suggests using water bath heaters instead of electrical heaters in new designs because of the greater fuel saving potential.

### References


Behnam Mirzaei is Head of Technical Inspection Affairs, Abdolrahim Najmi is Head of Research and Development, Amir Asghari is a Research and Development Engineer and Mohammad Reza Goodarzi is Head of Quality Control at the Iranian Gas Engineering and Development Company.
The answer to climate change, is change.

Change, from the way we now produce and consume energy, to a greener mix of oil and coal-powered energy coupled with the use of natural gas as an energy source. Natural gas emits an estimated 40-70% less carbon dioxide than other fuels, reducing the growing pressure on our ecosystem. Moreover, natural gas produces less sulphur dioxide, nitrogen oxides and particulate matter.

Petronet LNG is leading the change for a better environment by meeting about 30% of India’s total gas requirement and continuously striving to do things the greener way.
Surprise: Global gas price convergence has been happening since 2005

By Floris Merison

In the period 2005-2015, global natural gas markets have expanded and become more integrated through increased LNG trade, increased market-related pricing and gas hub development. From the basics of economic theory, it would be expected that global gas prices would converge. Research by the IGU Strategy Committee in cooperation with energy business school the Energy Delta Institute (EDI) now shows that global gas prices have indeed converged during this period. This is contrary to the conventional wisdom of global gas price divergence, based on a few regional gas price markers such as Henry Hub, NBP and Japanese import prices.

Market integration through growing LNG markets, increased market-related pricing and hub development are clear developments in the global gas market during the last ten years. Some good examples of improved conditions for gas market integration are shown in Figures 1 and 2, taken from the IGU World LNG Report, 2016 Edition, published by the IGU in April 2016.

Data from the IGU Strategy Committee show that global gas volumes sold against market-related (non-regulated) prices have increased by more than 35% in the period 2005-2015 (Figure 3).

The economic theory of the Law of One Price states that, in a perfect market, potential arbitrage opportunities between countries are immediately exploited by market participants, leading to convergence to one single price. From this perspective, it would be expected that global gas prices should have converged, due to increasing arbitrage possibilities and further market integration.

1 Market-related pricing is largely gas-on-gas competition and oil price escalation, with an element of bilateral monopoly and netback pricing.
However, the regular market view is that global gas prices diverged in this period. This is based on the developments of price benchmarks in only a few countries, such as the Henry Hub (US), NBP (UK) and Japanese import prices (Figure 4).

This graph shows that these prices diverged in the period 2008-2014. In 2015 they reconverged, but not (yet) to the extent of the years running up to 2007. These developments have been widely published and discussed in the gas industry.

The IGU Strategy Committee has been conducting Wholesale Gas Price Surveys for eight years in the period 2005-2015. The results of the 2015 survey, as well as the comparisons with previous surveys, were published in May 2016 in the IGU Wholesale Gas Price Survey, 2016 Edition.

Through conducting these surveys, a unique database has been built up, with data on gas price formation mechanisms, gas volumes, and annual average gas prices in 109 countries. The database enables analysis of different subsets of countries, categorised by properties such as price formation mechanism, region, and shares of imports.

This database has been used to shed more light on the apparent contradiction between the expectation of price convergence based on economic theory and market developments and the conventional market view of gas price divergence. The large number of countries available in the database, as well as the use of the coefficient of variation as a measure for price convergence provides new insights.

The coefficient of variation of prices of a dataset in a certain year is determined by the standard deviation divided by the mean value of these prices. The amount of absolute price variation (standard deviation) is thus measured relative to the average price in a certain year. A low coefficient of variation indicates a higher level of price convergence and vice versa. This measure is particularly suitable for datasets with a limited number of data points (eight years in our database), for a large number of price lines (109 countries in our database), and the ability to subdivide into subsets of countries with different mean gas prices.

Using the IGU database in this way, a trend of convergence can be recognised. In the period 2005-2015 the coefficient of variation of gas prices of 109 countries (including all significant gas-consuming nations) declined by 20%, indicating global gas price convergence (Figure 5).

In order to be able to trade to exploit arbitrage opportunities (leading to gas price convergence), countries should be connected to the global gas market. Connectedness to the global gas market could be realised through physical gas imports or through

---

**Figure 3.**

**Figure 4.**
Global gas price convergence has been happening since 2005. This is not surprising, since these prices are largely all indexed to crude oil, gasoil and/or fuel oil prices (Figure 8).

For other market-related pricing mechanisms (such as gas-on-gas competition), the results are less clear, due to significant changes over the years in the number of countries in these subsets.

When we look at the different IGU regions, Europe is the only region with sufficient countries to make meaningful convergence calculations. Here we can conclude that there is more price convergence amongst gas-importing countries with market-related pricing. We therefore looked at a subset of countries with a minimum level of gas imports (10%) and at a subset of countries with market-related prices. The result is as expected: the coefficient of variation is much lower in countries connected to the global gas market through physical imports and/or market-related prices (Figures 6 and 7).

When we look within the group of countries with gas imports as well as market-related pricing, we see that a subset of countries with oil price escalation as the main price formation mechanism shows more price convergence.
countries with market-related prices within Europe than on a global level. This, again, is not surprising since intraregional trade of natural gas is usually easier and less costly than interregional trade (Figure 9).

In recent years, the shale gas revolution has made the IGU’s North America region (Canada, Mexico and the United States) practically independent from gas imports from outside of the region. As a result, the region has become effectively disconnected from the global gas market. Therefore, in our analysis we have looked at a subset without these three countries, which all have relatively low, Henry Hub-based prices. The conclusion is that the trend of global gas price convergence is more distinct when we exclude the data of these – effectively disconnected – North American countries (Figure 10).

In conclusion, this research shows that global gas prices have been converging since 2005. This is against the conventional market wisdom of gas price divergence in the years towards 2015, but in line with developments towards further integration of global gas markets, such as the growth of LNG trade and increased market-related gas pricing. Less surprisingly, we also conclude that there is more gas price convergence amongst countries (1) with market-related pricing, (2) which are connected with the global gas market through gas imports, (3) with oil-indexed gas prices, and (4) within Europe. The trend of global gas price convergence in the period 2005-2015 is more distinct when we exclude the data of the – effectively disconnected – North American countries.

Floris Merison is Manager Dispatching & Transport at GasTerra.

This research has been conducted within the Pricing Group of the IGU Strategy Committee, chaired by Mike Fulwood of Nexant. Preceding research, with data up to 2014, was conducted as a thesis for an Executive Masters’ programme of the Energy Delta Institute. Research on global gas price convergence will continue within the IGU Strategy Committee based on upcoming Wholesale Gas Price Surveys. Results will be presented at the World Gas Conference in 2018.

Further reading:
PETRONAS Floating Liquefied Natural Gas:

Redefining Technology to Deliver Excellence

PETRONAS’ strategic undertaking which was first put forward in 2010 to develop the first Floating Liquefied Natural Gas facility has culminated into the successful development and completion of PFLNG Satu, PETRONAS’ first floating LNG facility, scheduled for operational start-up this year at the Kanowit gas field, 180km offshore Bintulu, Sarawak.

Limiting the need for extensive pipelines or heavy infrastructure, PFLNG Satu redefines LNG processing and production, creating an unconventional solution to monetize natural gas trapped in unviable locations where conventional rigs and pipelines simply won’t work.

Undoubtedly innovative, requiring state-of-the-art technology to address a multitude of technical and operational challenges, the entire facility, upon start-up, will encapsulate all the required LNG processing and production facilities, personnel accommodation and more importantly, an efficiently operable and HSE-compliant storage and offloading facility that allows for direct shipping to markets.

This game-changer epitomizes Malaysia’s excellence in inventive engineering solutions to meet increasing global energy demands. Once on-stream, PFLNG Satu will produce 1.2 million tonnes per year (mtpa) of LNG over a period of 20 years of its design life – boosting Malaysia’s total LNG production capacity to about 32 mtpa.

Consisting of 22 modular components, the facility includes gas treating, liquefaction, storage and offloading systems. The heart of the FLNG is essentially the liquefaction system which liquefies natural gas to minus 162 degrees Celsius, a process that shrinks its volume by 600 times. Once liquefied, the LNG will be stored in a dual row membrane type Cargo Containment System (CCS) before being offloaded to the LNG carrier.

“PFLNG Satu is the result of our tireless efforts in applying our best and brightest minds to innovate and deliver this groundbreaking energy solution in these challenging times. By unlearning conventional processes and reshaping the rules to design and build this technological marvel of unprecedented scale and ambition, we continue to press forward as a leading global LNG player,” said PETRONAS President & Group Chief Executive Officer Datuk Wan Zulkiflee Wan Ariffin.
PFLNG Satu further fortifies PETRONAS’ competitive edge in the value chain of the business from gas production right up to marketing of the LNG, offering end-to-end value to LNG buyers. With PFLNG Satu in its LNG portfolio, PETRONAS is well-positioned to drive and influence similar scale FLNG developments worldwide in terms of niche expertise and capability development.

PFLNG Satu is a first-of-its-kind development, hence unlike building onshore facilities where a Work Breakdown Structure (WBS) already exists for reference. The WBS for the project had to be developed from scratch and is based on active integration between upstream and downstream experiences, whereby strict project governance has been put in place to monitor each significant stage of the project.

The innovative and challenging part of the project is essentially building a plant on a floating barge, where the topside engineering work for offshore installation is far different from onshore design. Numerous technologies and solutions developed by PETRONAS’ very own Project Delivery & Technology division were applied. These included the PETRONAS Instrumented Protective Function (P-IPF™), a methodology to determine the adequacy of safety related instrumentation in a plant. The application of this process safety solution helps to identify and minimize process safety-related issues. Besides this, the FnGMap™, a 3D Fire and Gas Mapping software, accurately determines placements of fire and gas detectors for a hydrocarbon environment.

The PETRONAS Risk Based Inspection (P-RBI™) for plant and maintenance inspection software is also implemented. In addition, the PETRONAS Electrical and Safety Operability Review tool (P-ELSOR™) was developed and deployed to verify electrical system and equipment for preliminary and design stages to prevent potential electrical failures.

With the PFLNG Satu up and running in due course, the future remains optimistic for FLNG with the potential monetization of more than 600 marginal gas fields which would otherwise remain stranded and undeveloped without such a technology.

PFLNG Satu is testament to the Company’s continued fervor in driving innovation and technology excellence to meet global energy demand.

For more information please visit [www.petronasofficial.com/flng](http://www.petronasofficial.com/flng)
In 2015 for the first time welding robots could repair subsea pipelines down to 1,300 metres water depth.

Statoil and Gassco have, after years of technology development, proven that a new remote-controlled pipeline repair system could repair subsea pipelines by using a welding robot. A qualification programme was completed with a deep water test proving that all the new equipment works down to 1,300 metres. This link contains a video animation showing the pipeline repair operation: www.statoil.com/no/TechnologyInnovation/Features/Pages/RemoteControlledWelding.aspx

Emergency repair of subsea pipelines is essential for all major pipeline operators, and after several years of technology development, Statoil and Gassco completed the development and qualification process of a new pipeline repair technology using a welding robot as the primary method for repair of subsea pipelines larger than 30" and in water depths currently verified down to 1,300 metres.

The new remote welding system comprises three main modules that perform the subsea pipeline joining process:

◆ Remote welding habitat
◆ Remote welding power and control (POCO), and
◆ Remote welding tool

The remote welding habitat provides a dry, gas-filled habitat for the welding operation. A claw system supports and secures the pipes in order to achieve good alignment and no relative movements between the pipe ends during the first phase of the welding operation. The remote welding habitat contains a pipe sealing door at each
end providing a gas-tight sealing system around the pipe entrance into the habitat, and a sliding side door which closes and opens for the entrance of the remote welding tool from the POCO.

The remote welding POCO is a separate module that has two primary functions in the system:
◆ It contains all power and control function to support the welding operations.
◆ It provides dry storage of the remote welding tool during launch and recovery through the water column.

This module contains the most critical and vulnerable systems, and the option to recover this module separately from the larger remote welding habitat and the pipe preparation and positioning gives increased flexibility and improves the overall efficiency of deep-water operations. The remote welding POCO is permanently connected to the surface via an umbilical and is gas-filled with 0.4 bar overpressure relative to ambient pressure.

The last module is the remote welding tool which is a specially designed tool containing all the essential functions for the welding operation:
◆ Welding head with metal inert gas (MIG) welding torch and tip changer
◆ Welding wire consumable
◆ Induction heating system for sleeve and pipe joint drying and heating
◆ Survey head for close visual inspection, and
◆ Service head for light grinding and rework.

The three modules forming the remote welding system are parts in the total remote welding spread which in addition includes tools for all preparatory work:
◆ Coating removal unit (CRU)
◆ Weld seam removal tool.

The power and control module for the habitat contains the most critical systems for the operation.

The remote welding tool performs all the functions for welding the pipeline including inspection of the completed weld.
TBG is a Brazilian privately held business corporation, being a partnership among renowned worldwide energy groups. The company has been the owner and operator of the Bolivia-Brazil Gas Pipeline since 1999.

The promising natural gas market in Brazil is passing through challenging times as a result of both regulatory and energy balance changes. In this scenario, TBG plays a central role to enable an efficient gas transmission system for the country.

The company delivers up to 30.08 million m³ of natural gas per day to local distribution companies, thermoelectric power plants and refineries through 2,593 kilometres of Brazilian territory. The pipeline begins in Corumbá (Mato Grosso do Sul) and ends in Canoas (Rio Grande do Sul). It also crosses the states of São Paulo, Paraná and Santa Catarina.

TBG’s installed infrastructure capacity is composed of 15 compressor stations, 50 city gates and others pipeline facilities. The whole system is remotely operated on a continuous basis by TBG’s Supervision and Control Center located in Rio de Janeiro. The maintenance of the pipeline and its facilities is entirely performed by its own staff.

For 17 years, TBG has been consolidating its position, due to the recognition of its service quality in natural gas transmission and to the performance achieved by efficient management, reflected in a compression system reliability of over 98% in the last three years. The standards of excellence also come from investments in research and development of new technologies, in order to meet market demands.

As a result of recent regulatory changes, access to the Brazilian transmission system has become more open and competitive. General terms of access and an electronic platform will be available at TBG’s website (www.tbg.com.br) by the end of 2016. Until then, TBG is ready to interact with gas players, as well as helping them to build business solutions in order to meet their projects’ demands.

TBG commits to serve its clients with integrity, competence and innovation, also respecting the community and the environment, while contributing to national energy security.
Natural gas transmission systems

TBG is the way to go

TBG operates along the entire value chain of natural gas transmission. Through the Bolivia-Brazil Gas Pipeline, the company supplies natural gas to seven Local Distribution Companies, thermoelectric power plants and refineries in five Brazilian states.

17 years of experience qualifies TBG to develop all phases of gas pipeline projects for transmission and transfer systems, from conception to execution. Our portfolio also includes operation and maintenance services for these assets.

TBG remotely operates

- 15 Compressor Stations
- 50 City Gates
- 2 Operational Measuring Stations
- 2 Pressure Reducing Stations

Bolivia-Brazil Gas Pipeline

- Delivers up to 30 million m³/day of natural gas
- Supplies regions which account for more than 50% of Brazil’s GDP
- Runs through 2,593 km across five Brazilian states
- Compression system reliability over 98% in the last three years

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Solutions in natural gas transmission systems
The operational steps using the remote welding system are first to install the remote welding habitat by means of the vessel crane. At this stage the pipe ends are prepared by removing all external coating, cutting to length and welding pigs are installed in each pipe end to create the barrier towards the gas pocket in the habitat. After landing the habitat on the seabed, the following tools are used:

- Hydraulic lifting frames (3 to 4 ‘H’-frames needed in the operation)
- Pipe cutting tool
- Welding pigs and insertion tool, and
- Pipe alignment and monitoring system

The above tools are all operational in the Norwegian Pipeline Repair and Subsea Intervention (PRSI) Pool and are commonly used for subsea pipeline tie-ins and repairs.
The repair spool and welded sleeve design. Traditional butt welding techniques are challenging in an automated system so sleeve welding was chosen as an appropriate solution.

seabed, the pipe ends are lifted into the habitat and secured by the pipe claws, the pipe doors and side door are closed. Then the habitat closure is filled with argon gas (blow-down) and the inert atmosphere dehumidified in order to establish acceptable environmental conditions for the welding process.

The second stage of the operation is to launch the POCO over the vessel side or by means of a module-handling tower through the vessel moon-pool. The enclosure is kept at a constant gas overpressure of 0.4 bar in order to ensure no water leakage into the electrical systems, welding tool and consumables. The POCO is landed on the habitat side platform and engaged on the connection interface.

After verifying the interface seals are tight, the connection system is dewatered and opened to allow the remote welding tool to enter the habitat, the tool is driven to the pipe and the pre-heat bands are closed and engaged around the pipe.

The pre-heat system then heats the pipe to a specified temperature and the welding path is learnt and logged by the welding tool. Welding may then commence and the pre-programmed welding sequence is performed under supervision and control by a welding operator and a welding engineer.

Acceptance of weld quality is based on a process monitoring quality control system using predetermined ranges for all essential welding parameters. All parameters within a ‘green zone’ means an accepted weld, while deviations need to be assessed and in a worst...
case the rejected portion of the weld pass has to be ground away by the onboard service head grinding tool.

An important part of the development of the remote welding system was to develop a suitable pipeline repair strategy and method of joining the pipe ends together. Traditionally pipeline welding is performed by a butt weld joining technique, i.e. welding the abutting pipe ends by a full through-wall thickness weld. In an automated system this technique presents several challenges, and this was the main reason for choosing a sleeve welding repair technique that is less demanding at this phase of development.

The oversized thick wall sleeve is pre-welded to each end of the repair spool during onshore fabrication, while the final weld between the sleeve and pipeline is made subsea inside the dry habitat. The weld is designed to the actual strength requirement, and is grossly over-dimensioned in order to distribute the stress concentration into the highly utilised pipe wall outside the weld sector.

The equipment that has been developed is another step in a continuing drive for increased capacity, application range and water depths for subsea pipeline repair technology. Since 1987 the PRSI Pool in Norway has continuously developed new technology and capacity to cover the members’ need for pipeline repair preparedness. Today, 13 operating companies are part of this pool, and more than 15,000km of pipeline are covered by the pool services.

Further development of the remote welding system is typically foreseen within the following areas:
◆ Extend the diameter range to smaller size pipelines
◆ Develop in-situ shallow water repair down to a water depth of 9 metres
◆ Extend the water depth capacity to 2,500-3,500 metres
◆ Develop a methodology for repair of clad or lined pipelines

Expanding the remote welding system to smaller size pipelines will most likely be done in two steps; the current system can be modified to accommodate down to 24” pipelines relatively easy by simple geometrical modifications, but in order to expand the diameter range to cover pipelines from 10” to 24”, a slight adjustment in concept is required to utilise the size benefits.

Increasing capacity for deeper water depths down to 2,500-3,500 metres, based on experience to date, is best solved by a new concept for gas and performance optimisation and a development project is foreseen to realise such possibilities.

Another application area where remote controlled technology may be beneficial is in the very shallow water range, typically from 9-20 metres. This is a depth range where diver-assisted operations are very demanding and resource intensive. Studies to look into how the new remote welding system could be utilised for this depth range is ongoing and could well result in further developments and new application opportunities.

Finally, the new remote welding system may be applied on bi-metallic materials such as for the repair of clad or lined pipelines. This capacity requires further development of the welding technique while the basis technology and system are the same.

A hyperbaric welded repair is superior to any mechanical repair due to its lifetime, reliability and pipeline integrity. This is the main business driver to continue development of this technology for new applications in the future.

Jan Olav Berge is Senior Advisor Pipeline Technology, Statoil.
LOOKING AHEAD.

We plan for the future. More than one-third of ROSEN employees work in research and development, creating innovative products needed by the industry. An investment we are proud of.
Harnessing customer feedback for outstanding customer experience

By Marie Lyster and Rory Somers

“Your brand is formed primarily, not by what your company says about itself but what your company does.”

Jeff Bezos, Amazon CEO

The future is all about customer experience

Customers always have an experience – good, bad or indifferent. The challenge is to influence the customer in a way that differentiates this experience and delivers value. Customer experience has now overtaken price and product as the key brand differentiator. Organisations are fast realising that it pays to focus on delivering excellent customer experiences – companies that are excelling in customer experience are growing their revenues at 4-8% above their market average (Bain & Co).

This has resulted in almost 90% of companies stating that in 2016, they would be competing primarily on the basis of customer experience (Gartner).

However, while 80% of companies believe that they deliver a superior customer experience, only 8% of their customers agree (Bain & Co).

Given this drive and emphasis on customer experience it is important to understand what is meant by the term customer experience. Essentially it is the sum of all the experiences your customers have with you. The simplest definition may be that customer experience is the organisation’s brand promise and brand values in action on the ground. If you can unlock what’s unique and true about your brand, and deliver exceptionally on the promises your brand has made to customers, then you’ll get your customers talking.

Employee engagement is key to delivering excellent customer experiences

As businesses are both product and people based the delivery of the brand and a great customer experience on the ground involves the entire company, both customer-facing people as they interact with the customer, but also those in the background as they work with each other in the interests of the customer.

Employee engagement and commitment is therefore key to driving improvement in customer experience, placing employees at the centre of your customer experience management programme.

So where does feedback/measurement fit in?

“To value your customer you need to spend some time understanding the interactions they have with you, viewing your service through their eyes and designing in such a way that
Gas Networks Ireland – a case study
Gas Networks Ireland (GNI) owns, operates, builds and maintains the natural gas network in Ireland. They connect and deliver gas to more than 673,000 domestic customers and 25,000 business customers regardless of their gas supplier. Their core purpose is to ensure the safe and reliable delivery of gas to customers 24 hours a day, 365 days a year. By serving their customers and collaborating with their partners, they continually advance the utilisation of the gas networks for the benefit of Ireland. GNI's mission is ‘Committed to putting our customers first’. They strive to live up to their values: customer service; safety; performance; integrity and collaboration in all behaviours and interactions with customers, staff, suppliers, stakeholders and the general public in the pursuit of excellent experience.

Organisational approach
The challenge is to deliver a ‘joined-up and seamless’ service that puts customers first while operating an optimised business model employing key business partners which are an extension of the Customer Care team, for example:
◆ Contact Centre  
◆ Field staff  
◆ Customer experience monitoring provider all collaborating effectively with external stakeholders including regulators, local authorities, installers and suppliers.

Find the sweet spot for your organisation by managing the tension between business efficiency and a customer’s desire for distinctive experiences. Living your brand involves the entire organisation – in a truly customer-centric business model, the customer experience is driven by everyone:
◆ as they interact with the customer  
◆ and as they work with each other in the interest of the customer  

Together these should both help to increase business efficiency and customer preference.

Putting customers first
Traditionally the key focus in GNI has been safety first – a predominately engineering, driven organisation. GNI’s customer experience management programme required a framework – ‘Insights into Action’ – to measure customers’ experiences, identify what the ideal experience is in their minds and in turn aid the organisation to identify and implement improvements and process change that puts the customer first.

The five key principles GNI follow in doing this are:
◆ Take a customer focus rather than job focus – stand in our customers’ shoes and see things from their perspective  
◆ Focus on the whole journey rather than key moments of truth  
◆ Engage a combination of metrics and methods – don’t rely on one metric  
◆ Consider the service ecosystem – that multiple parties are involved in influencing the customer’s experience  
◆ Get it right first time
gas leak continued to be a very stressful activity for customers involving a great deal of personal effort. Even greater reassurance was needed.

**Communicate**

Real time monitoring and sharing the insights across the business and with external partners through monthly reports, intranet and stakeholder meetings highlighted customers’ difficulties and the issues for the business.

**Solution**

As a utility with an outsourced business model, a successful solution required collaboration. GNI engaged with the internal emergency team, the RGII (Registered Gas Installers of Ireland) and our business partners through monthly meetings, and a quarterly Customer Experience Day, to identify and commit to ways they could address this issue together.

**Actions**

GNI revised the phone line’s welcome message deterring non-emergency calls, removing any delay for emergency callers.

A training module was developed using customer roleplay in a specially designed streetscape, ‘Lamplighters Row’, for attending fitters, empowering them to reassure customers better.

Collaborating with RGII, a brochure was developed explaining RGII’s role and responsibilities.

A follow-up phone call to customers was introduced within 24 hours to ensure they understood the next steps.

The impacts of these actions have been seen across the company:

- There has been a 37% reduction in unwanted calls on the emergency phone line following the introduction of the new message. 95% of calls are now answered in 20 seconds.
- Reassuring customers better means we have reduced the amount of effort it takes customers to report a suspected gas leak. “I was amazed how quickly the call was responded
Harnessing customer feedback for outstanding customer experience

In summary

“The most basic of all human needs is the need to understand and be understood. The best way to understand people is to listen to them.”

Ralph Nichols

Harnessing customer feedback to consistently improve their experience through the Insights into Action programme has worked for GNI. The journey that the organisation has taken points to the importance of the following in building a great framework or programme for others:

◆ Collect relevant, accurate and timely data to identify insights
◆ Put the customer at the centre
◆ Identify quick wins and process changes
◆ Integrate brand values
◆ Seek out and integrate best practice from other organisations
◆ Incorporate the perspective of employees and other stakeholders as you are relying on them to deliver a great experience
◆ Embed it across the organisation – every department should be thinking about the customer experience
◆ Broad and deep – consider every interaction you have with the customer
◆ Always ask “Why?” – question everything to ensure it works for the customer

The importance of executive support:

“Customer focused service delivery is a fundamental element of Gas Networks Ireland’s overall business strategy. GNI and business partners work tirelessly to truly put our customers at the heart of our business, always pushing the boundaries and the business to deliver on and exceed our customers’ expectations. The customer experience programme has delivered significant returns in terms of customer satisfaction, employee engagement and overall business performance.” Liam O’Sullivan, Managing Director, Gas Networks Ireland.

Marie Lyster is Customer Experience Manager and Rory Somers is Networks Materials Manager at Gas Networks Ireland.
DEPA, which introduced natural gas into the Greek market, has a key priority—to further expand its network. A crucial step, already underway, is to develop and deploy CNG/LNG technology to supply natural gas to remote areas, individual customers, and the country’s numerous islands.
DEPA is also active in the development of projects with an international capacity: the IGB (Interconnector Greece – Bulgaria) and IGI (Interconnector Greece – Italy) natural gas pipelines, as well as the Eastern Mediterranean Pipeline (EastMed). These projects will increase Greece’s interconnection with the southeast European network and further enhance European energy security and diversification of sources and routes.

DEPA / The Natural Gas Company of Greece
Features

This issue of International Gas is one of celebration. Firstly we look back at the successes of the LNG 18 Conference and Exhibition in Perth, Australia, and the future prospects for the ever-growing LNG industry which were discussed by its leading figures.

IGU celebrates its 85th anniversary this year and we present a brief overview of the major developments in its history down the years, reflecting the growth of the global gas industry in this time.

The IGU Council Meetings in Amsterdam will be the last presided over by the Norwegian Secretariat as its unprecedented nine-year term hosted by Statoil draws to a close. To mark the changeover we begin with greetings from Statoil’s CEO Eldar Sætre and outgoing Secretary General Pål Rasmussen, and then highlight the work of IGU undertaken in this period of great expansion and engagement. Following this is a special Q&A with Pål Rasmussen and Deputy Secretary General Luis Bertrán Rafecas who will soon take over the reins when the Secretariat moves to Barcelona with the support of Gas Natural Fenosa. And rounding off this section, Luis shares his vision for the next chapter of IGU’s story.

We close with an introduction to IGU’s five newest Associate Members.
LNG approaching critical mass as a globalising force for natural gas

By Alex Forbes

Amidst all the near-term worries of supply gluts, faltering demand and weak prices, the direction of travel for LNG is becoming clearer. While the coming five to eight years will be a tough time for producers and the sponsors of new liquefaction projects, the long-term future for the industry looks promising – as LNG becomes an ever more potent force in the globalisation of regional gas markets. The very factors that are challenging in the near term are likely to be sources of opportunity in the long term: low gas prices will encourage market growth; low oil prices will accelerate moves towards new gas pricing mechanisms; new climate policies will make gas more competitive with coal. That was a clear message from the LNG 18 conference in Australia this year.

Another was that the industry needs to work harder to realise its full potential. “Don’t take it for granted,” cautioned one leading CEO.

The triennial LNG X conferences have long been the largest regular gatherings of the liquefied natural gas industry. Until a decade or so ago, while LNG remained a niche industry, they felt like the meetings of a select club: many of the participants knew many of the other participants, having got to know each other during negotiations for new projects and sales and purchase agreements (SPAs). The international oil and gas companies (IOGCs) and the national oil and gas companies (NOGCs) would send their LNG specialists.

LNG 12 in Perth, Australia in 1998 was just such an event. At that time, there were nine LNG-exporting nations and nine importing nations. Around 84 million tonnes of LNG were traded in that year and the shipping fleet consisted of around 108 vessels.

Last April, at LNG 18, Perth became the first city to host the event twice. In the intervening time, LNG trade trebled. According to the 2016 edition of the IGU World LNG Report – launched at LNG 18 – in 2015 LNG trade grew to 245 million tonnes. The number of producing countries was up to 17, despite Angola and Egypt having ceased exports since 2014. The number of importing countries was up to 33. The shipping fleet had grown to 410 vessels, and the average size of ships had expanded too. Regas capacity around the world had reached 757 million tonnes per annum (Mtpa), with another 73 Mtpa due on stream by 2019.

A gathering of gas leaders

Impressive as these numbers are, arguably the most telling sign at LNG 18 of how important LNG has become was that many IOGCs and NOGCs fielded not just their LNG specialists but also their CEOs.

In attendance – and mostly leading the discussions – were Shell’s Ben van Beurden, Chevron’s John Watson, ConocoPhillips’ Ryan Lance, Total’s Patrick Pouyanné, Petronas’s Datuk Wan Zulkiflee Wan Ariffin, Inpex’s Toshiaki Kitamura, Woodside’s Peter Coleman, RasGas’s Hamad Mubarak Al Muhammadi, Gazprom Export’s Alexander Medvedev and others.

LNG 18 was as much a gathering of the world’s natural gas industry as it was an LNG conference.

To those who follow closely the development of the natural gas industry, this should not come as a surprise. As this magazine has previously reported (International Gas, October 2015 – March 2016, pages 78-89), the big IOGCs are steadily becoming bigger producers of natural gas than they are of oil. And LNG
trade has been growing at around three times the rate that the gas industry has been growing overall – a compound annual growth rate of 6.5% over a period of almost two decades (International Gas, April – September 2016, pages 112-123).

**“Towards a globally integrated gas market”**
The growing importance of LNG to the development of global gas trade dynamics was highlighted by BP’s Chief Economist Spencer Dale at the launch of the BP Statistical Review of World Energy in June. In the analysis that accompanies the 2015 data, Dale said:

“The deceleration in China’s gas consumption, combined with falls in South Korea and Japan, meant that after being the primary growth market for LNG over the past five years or so, Asia’s LNG demand fell in 2015. As a result, LNG flows were diverted west, with increased LNG imports to both Middle East and North Africa [MENA] and Europe. This shift in the pattern of trade flows went hand-in-hand with a sharp narrowing in price differentials, with the Asian premium over European gas prices virtually disappearing.

“The key takeaway here is that, as global LNG supplies grow in importance and, as a consequence, global gas trade becomes increasingly price sensitive, the impact of shocks or disturbances in one part of the world, in this case weak Asian demand, will be increasingly transmitted to other parts of the globe. We are moving towards a globally integrated gas market.”

**A new growth phase**
This process of globalisation looks set to accelerate as the LNG industry undergoes another phase of rapid growth. At LNG 18 several speakers forecast that LNG supply by 2020 would reach 350 Mtpa, with some even more optimistic. “We expect worldwide LNG production to increase to approximately 370 Mtpa by the year 2020,” said RasGas CEO, Hamad Mubarak Al Muhannadi.

Looking further ahead, Melody Meyer, President of Chevron Asia Pacific Exploration and Production Company, said: “By 2025 LNG demand is expected to reach 420 Mtpa, nearly double today’s market. This rising demand will be driven by global economic growth, and the rising share of gas as part of that growth …
The biggest change we’ll see will be the proliferation of smaller and smaller markets – 0.5-1 Mtpa markets – where demand can be met very quickly with floating storage and regasification units [FSRUs].”

Meg Gentle, President of Marketing at Cheniere Energy, added: “The expected call on LNG by 2030 requires nearly 230 Mtpa of new liquefaction capacity to be starting construction by 2025. That is at least 45 new trains that need to reach final investment decision [FID].”

A looming gas glut

The International Energy Agency (IEA), in its latest Medium-Term Gas Market Report (MTGMR), forecasts that LNG demand will increase by 140 billion cubic metres (bcm)/year (103 Mtpa) between 2015 and 2021, while new liquefaction capacity will grow by 190 bcm/year (140 Mtpa). It therefore sees “a high likelihood of under-utilisation of LNG export plants”.

Most of the new liquefaction capacity due on stream by 2020 is in Australia and the United States.

In Australia, from 2009 onwards, seven LNG supply projects reached FID, with total capacity of 62 Mtpa. The first project started up in late 2014 and all are due on stream by 2018. Once fully operational, they will take Australia’s liquefaction capacity to 87 Mtpa.

In the US, five projects have taken FID and begun construction, with aggregate capacity of 66 Mtpa. Of this total, 32 Mtpa is being constructed by Cheniere, which has started up two trains at the first liquefaction project in the Lower 48 states: Sabine Pass. All the trains are due to start up by 2019.

So, by the end of the decade, Australia and the US will have combined production capacity of 152 Mtpa, of which 128 Mtpa will be new.

A few other projects should also be on stream by then, among them Russia’s Yamal LNG.

When all this new capacity was being planned, demand was expected to grow fast enough to absorb its output, or at least most of it. However, some buyers, finding they are over-contracted, are looking to sell on volumes – or liquefaction capacity in the case of projects using a tolling business model – in an emerging secondary market.

At LNG 18, Grant King – Chairman of the LNG 18 National Organising Committee – said: “The liquidity in the secondary market will accelerate and will deepen, because buyers will be using the destination flexibility that they have under the contracts. That will result in a more liquid secondary market. That’s where you’ll see price movement, more than in the contract market, because the contract market is what it is. That secondary market will drive growth in demand.”

Other buyers, meanwhile, have been seeking early price reviews for their long-term contracts. An example that got a lot of attention at LNG 18 is India’s Petronet, which has renegotiated an SPA with Qatar’s RasGas, obtaining a lower price in return for taking higher volumes.

Market uncertainties

In Japan, the world’s largest LNG market, LNG imports in 2015 were down 3.1 Mt on 2014, following the first re-start of nuclear reactors since 2013, weaker electricity demand, and
EXPERIENCE COUNTS

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that the immediate prospects for the re-opening of nuclear stations are less optimistic than when we were last there ... A lot more LNG may have to be imported to compensate for those stations that may be slower to open than is currently anticipated.”

Another uncertainty is the market liberalisation taking place in gas and electricity. Masayuki Tanimoto – Director-General of the Oil and Gas Finance Department of the Japan Bank for International Co-operation (JBIC) – told the conference:

“Japan has liberalised the electricity market and next year we will have the liberalisation of the gas market. We are transitioning from a centrally-planned economy to a real market economy, so it’s getting more difficult for Japanese utilities to make a long-term commitment, like 20 years, because they cannot be sure how big a share of the market they can get after competition.”

The response to these developments by JERA – the joint venture established by Chubu Electric and Tokyo Electric (TEPCO), now the world’s largest LNG buyer – was outlined by its President of Fuel Procurement, Yuji Kakimi:

“We are going to diversify contract maturities in our portfolio. Second, we are going to buy less LNG employing an oil-linked pricing formula. Third, we are going to build a robust trading function, both on the buy and sell sides, to adapt to large swings in demand for LNG and to optimise our purchases. Fourth, we will be engaged proactively in the development of LNG projects.”

There is also uncertainty over how quickly LNG demand will grow in China, already the world’s third-largest LNG market. While demand growth has slowed, government policy is to boost the share of gas in the primary energy mix from around 6% today to 10% by 2020.

Li Hui, Vice-President at CNOOC – one of China’s big three state-owned oil and gas companies – told delegates: “As an emerging market, China offers great opportunities for the inter-fuel competition. Looking forward, the nation’s energy companies face big uncertainties, one of which is over the pace of re-starts of its fleet of nuclear power stations.

At LNG 18, Professor Jonathan Stern of the Oxford Institute of Energy Studies (OIES) said: “The problem for those of us who visit Japan regularly is that every time we go back we find
Sempra LNG & Midstream develops and builds LNG receipt terminals, liquefaction facilities and midstream natural gas infrastructure in North America and is active in the sale of LNG worldwide.

To learn more about Sempra LNG & Midstream, our projects in development and exciting career opportunities, visit: www.SempraLNGM.com.

QUICK FACTS

» Sempra LNG & Midstream developed one of the first liquefaction export facilities in the U.S., Cameron LNG in Louisiana; and 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 Energía Costa Azul.

» Our Pipeline & Storage projects in development provide the required infrastructure to LNG export terminals and other industrial customers.

» Our projects in development will help meet the global demand for energy.

Sempra LNG & Midstream is not the same company as San Diego Gas & Electric (SDG&E) or Southern California Gas Co. (SoCalGas), and Sempra LNG & Midstream is not regulated by the California Public Utilities Commission.
gas industry. In 2015 China consumed 193 bcm, increasing by 5.7% year-on-year. According to the official forecast, by 2020 the share of natural gas consumption will rise to 10%, which represents 300-360 bcm/year.

However, China’s gas market is still immature. “Gas infrastructure needs to be improved, especially the storage and peak-shaving facilities,” said Li, adding that “Chinese buyers are facing great challenges in the execution of existing long-term LNG supply contracts”.

What about Europe?
The prospect of large volumes of uncommitted LNG looking for a home in an oversupplied market raises the question of where it will all go. There is a growing consensus that much of it will be targeted at Europe. This issue was the focus of an OIES report published early this year which was reported on in some detail in the previous issue of this magazine (International Gas, April – September 2016, pages 112-123). It is a view that has since gained currency, both at LNG 18 and in developments since.

At the launch of its MTGMR in June, the IEA said: “Fundamental developments point to oversupply in the market over the forecast horizon of this report [2016-2021] which should keep spot gas prices across the globe under pressure: ‘unwanted’ LNG supplies will look for a home in Europe, due to the flexibility of its gas system and well-developed spot markets.”

This will result in intense competition developing among producers “to retain or gain access to European customers”. “We are at the start of a new chapter in European gas markets,” said the agency’s Executive Director Fatih Birol.

At LNG 18, an analysis of how this development might pan out was presented by Benjamin Maruenda, Chief Strategy Officer for the LNG business of Engie, the largest importer of LNG into Europe.

“As we understand that most of the additional LNG to Europe would come from the US,” said Maruenda, “at what Henry Hub and NBP levels would this happen? There are three scenarios. “If NBP is high, above $7/million British thermal units (MBtu), with Henry Hub at $2/MBtu, US LNG will enter into Europe without any restriction. If NBP is at a medium level, we think that in such a scenario US LNG would also come into Europe as the players would consider fixed costs as sunk and [make decisions] on a marginal cost basis. If NBP is low, US LNG will not be exported into Europe and some liquefaction plants would be shut in. However, in that scenario there would be a switch from coal to gas which eventually would increase the demand for gas in Europe.”

The single most important factor in the evolution of European prices will be Russia’s gas export strategy. If Gazprom chooses to defend price, LNG imports into Europe will rise very substantially, reducing the share of Gazprom’s pipeline gas exports to Europe. If Gazprom chooses to defend market share, however, prices could fall to levels that would make US LNG exports to Europe uneconomic.

One of the speakers at LNG 18 was Alexander Medvedev, Deputy Chairman of Gazprom’s Management Committee, and the longtime Head of Gazprom Export. But he gave no clues as to which option Russia might adopt. So we have yet to see what the world’s largest gas company will choose to do.

Opportunities
While there was a sense of resignation at LNG 18 that the period from now to around 2023 will be a challenging time for the natural gas industry in general and the LNG industry in particular, the mood of the conference was far from being one of doom and gloom.

Time and again, industry leaders expressed their confidence about LNG’s bright prospects over the long term – a time span measured in decades rather than years – because the very factors that are currently challenging the industry are potentially sources of opportunity.
Global receiving terminal capacity 2000-2021

Note: The above forecast only includes projects sanctioned as of end-2015. Owing to short construction timelines for regasification terminals, additional projects that have not yet been sanctioned may still come online in the forecast period, as indicated by the hatched bars. Although several FSRU contracts will expire over this time period, this forecast assumes that the capacity will remain in the global market.

Sources: IHS, Public announcements.
Commitment to innovation and opportunity
Founded in 1970, Samsung Engineering has grown from a modest, domestic engineering firm to a globally recognised name in the engineering, procurement and construction (EPC) market. Attracting talent from around the world, Samsung Engineering has broadened its business portfolio to a full range of engineering services: oil and gas processing, refinery and petrochemical plants; power plants; environmental facilities; and industrial production facilities. Samsung Engineering had an especially strong presence with gas projects starting with its first international project in 1993, winning PTT Public Company Ltd.’s gas separation plant (GSP-4) in Thailand and has continued by offering an ever-expanding list of engineering services.

By pairing innovative, cost-effective engineering with flexible, efficient management, Samsung Engineering is able to provide significant, dependable value to our clients. Looking towards the future, Samsung Engineering is primed to contribute to both emerging and established global industries.

Samsung Engineering at a glance
Samsung Engineering is an EPC leader in hydrocarbon, power and industrial & environmental plants, providing services from feasibility studies, financing, engineering, procurement, construction to O&M. About 1,000 projects have been built worldwide by Samsung, bearing witness to global competitiveness, particularly in quality, cost and delivery.

Samsung Engineering is expanding its business presence globally in step with international market trends, diversifying and stabilising its business portfolio.

Hydrocarbon

Oil and Gas Processing, Refinery, Petrochemical

Power
Coal-fired, Oil-fired, Gas-fired (Simple Cycle, Combined Cycle), IGCC (Integrated Gasification Combined Cycle), CHP (Combined Heat and Power Plant)

Industrial & Environmental
IT, Pharmaceutical (Bio), Manufacturing, Sewage Treatment, Wastewater Treatment, Water Treatment, Water Reuse, Desalination, Ultra-pure Water, Air Pollution Prevention, Waste Treatment

We build the word through gas projects – Samsung Engineering your growth partner for the future

Samsung Engineering has completed numerous gas-related projects including six gas oil separation plant (GOSP) EPC and 11 gas separation plant (GSP) EPC projects as well as three liquefied natural gas (LNG) liquefaction feasibility study/front end engineering design (FS/FEED) and one LNG Terminal EPC project, making a total of more than 30 gas projects worldwide.

Recently, Samsung Engineering’s strategic focus lies in LNG liquefaction projects, where major investments have been made. Several feasibility studies for medium-sized LNG liquefaction projects have been realised and FEED projects in America have been made. For large-sized LNG liquefaction projects Samsung Engineering relies on strategic partnerships with proven and experienced global LNG EPC players. In further enhancing capabilities for LNG projects, Samsung Engineering made the effort to secure LNG experts from all over the world as well as use repeated experience from proven major technology licensors such as Air Products and Chemicals, Inc. (APCI).

Besides LNG projects, GOSP/GSP are major focuses for Samsung Engineering. Abundant experiences in the last five years provide optimised solutions for GOSP/GSP project execution. Samsung Engineering’s efficient project management capacities led to the successful project execution of large-sized projects, bringing confidence and trust to clients. This is especially shown by repeated contract orders Samsung Engineering is receiving from loyal clients such as PTT from Thailand.

Representative LNG/GOSP/GSP project experiences include: for LNG liquefaction – the Texas LNG project with LNG liquefaction of 2.1 Mtpa, APCI (liquefaction), UOP (pre-treatment) as licensor; for LNG terminals – the CFE Manzanillo LNG terminal with LNG receiving capacity of 14 Mm³/d and two 150,000m³ LNG tanks; for GOSP, gas treatment/NGL recovery – the Shaybah Project with 113.3 Mm³/d of gas separation and 68 Mm³/d of gas treatment/NGL recovery; and for GSP – the GSP-6 and ESP projects, which combined pro-

Process experience
- GOSP (gas oil separation plant)
- GSP (gas separation plant)
- ASU (air separation unit)
- LNG liquefaction
- LNG regasification

Technology experience
- APCI
- Shell
- UOP
- BASF
- Ortloff
- Jacobs
- Mitsubishi Heavy Industry
- Haldor Topsoe
cessed 45.3 Mm³/d of gas (22.65Mm³/d each) and was the world’s largest plant of this kind at that time.

Samsung Engineering capabilities for gas project execution include the following:

**Remote area execution** Saudi Arabia, Iraq, Algeria, Indonesia, Malaysia, Thailand, etc.

**Simultaneous project execution** Two in Thailand (GSP-6 and ESP); multi-package complex across five separate job sites (Shaybah NGL Program).

**Mega-size GOSP/GSP project execution** Saudi Arabia Shaybah NGL Program (Over $2 billion); Iraq West Qurna Phase-2 (Over $1 billion); Thailand GSP-6 and ESP (Over $1 billion).

**All-round technology execution** UOP, Ortloff, Shell, BASF, ABB, APCI and more.

**Utmost efficient and real-time completion execution** Zenator, SCMS, CM Tool, Plentiful Lessons Learned and Best Practice.

**Project focus: Thailand**

PTT Public Company Ltd. operates four gas separation plants, GSP-1, GSP-2 and GSP-3 and GSP-5, with a total capacity of 41.9 Mm³/d at its Map Ta Phut gas separation complex in Rayong, Thailand. The Map Ta Phut plants recover ethane and propane as feedstock for petrochemical plants located in the area and LPG as fuel to be utilised by the transport sector. The remaining gas is used for the production of electricity and fuel for the transport industry. To cope with the rising demand for these products and to maximise the use of indigenous natural gas, in September 2007 PTT awarded Samsung Engineering the GSP-6 gas separation plant and ESP ethane separation plant project.

The engineering, procurement, construction, pre-commissioning and commissioning project was delivered on a lump-sum, turn-key basis, and achieved project completion in January 2011 for GSP-6 and February 2011 for ESP.

With GSP-6 now successfully completed, the plant has a capacity of 22.65Mm³/d, recovering ethane, propane, butane, liquefied petroleum gases and natural gas liquids from natural gas. The ESP also has a capacity of 22.65Mm³/d, separating gas as well as ethane. The products are supplied to downstream petrochemical plants and supplement the local market for domestic consumption while residual gas is sent to the natural gas distribution network.

Both projects were safely completed. By close of construction about 20,000,000 man-hours were achieved for GSP-6 and 15,000,000 for ESP. Further, the projects were completed on-time and on budget. Scale-wise it was the largest gas separation plant in the world at the time in terms of production numbers through fractionation units such as C2, C3, C4, NGL, iso-pentane with feed throughput of 68 Mm³/d simultaneously in the ESP and GSP-6 Plant.

Samsung Engineering received a distinguished project award in 2011 for the GSP-6 project from PMI (Project Management Institute) for its project management capabilities.
There was much discussion at LNG 18 of the impact that a prolonged period of low prices could have on the expansion of existing LNG markets and the development of new ones – in new territories and in new applications, such as road transport and marine bunkering. Figure 1, previous page from the latest IGU LNG report, shows a forecast of the growth of regasification capacity based on projects sanctioned as of end-2015. However, the report stresses that...
short construction times, especially for floating regas, could see more projects come online during the forecast period. Current low levels of capacity utilisation also present opportunities for market growth.

**Gas prices**

At LNG 18 several speakers said that the 2011-2014 period of $100-plus/barrel oil prices should be regarded as anomalous. Analysing the development of energy prices from 2008 to 2016, Christopher Goncalves of the Berkeley Research Group identified three broad phases: pre-2011; 2011 to 2014; and post-2014 (see Figure 2).

“In hindsight perhaps the industry will look at what happened from 2011 to 2014 – after the Great Japan Earthquake and the Fukushima [nuclear] tragedy – as a period of anomaly,” he said. “Global prices are re-converging, oil-indexed prices are re-converging with hub prices, and regional prices in Asia, Europe and the Americas are all pulling closer together, as a function of greater liquidity and weaker demand.”

Cheniere Energy – which by 2020 will be the dominant owner of natural gas liquefaction capacity in the United States and one of the largest owners of liquefaction capacity in the world – sees the share of spot and short-term LNG trade (defined by importers’ group GIIGNL as contracts with a duration of four years or less) growing to 50% of the total by 2020 (see Figure 3). Such an outcome would represent a rapid acceleration of what has been a long-term trend, leading to a huge increase in...
LNG import prices. The recent sharp fall in international benchmarks in conjunction with significant revisions to domestic pricing policies and continued gradual progress in building out gas infrastructure should help drive demand growth in this highly price-sensitive market.

But it is critical that affordability is seen as sustainable if gas is to compete with coal and renewables over the long term. As several speakers at LNG 18 stressed, effective carbon pricing is one major potential contributor to this.

Moving away from oil indexation
Other potential contributors include: reductions in project costs; and a move away from oil indexation in gas contracts to free gas from the vagaries of the irrelevant and damaging volatility of oil prices. Buyers and sellers are now looking for more meaningful pricing mechanisms that reflect the supply and demand fundamentals of gas rather than oil.

Commenting on the evolution of gas pricing mechanisms in Asia, Jonathan Stern said: “It is no longer possible to price LNG, or indeed gas, in relation to oil products ... These contracts have got to find a way – as we have tried in Europe, with some difficulty – to move to a supply-demand basis for gas rather than oil.”

Even Asian buyers – currently benefitting from long-term contracts indexed to low oil prices – are saying they want less exposure to oil price. “To develop our customer base more and more, we need more and more market-based pricing – not oil-linked pricing,” said Kunio Nohata, Senior Executive Officer of Tokyo Gas.

However, while there exists a growing consensus that oil indexation is not the optimal way to price natural gas, the debate around alternatives is a lively one. At LNG 18 there was much discussion about how LNG into Asia could be priced in a post-oil-indexation gas price world. For example, will a hub or hubs emerge in Singapore, Japan and/or China?
“My observation is that for the time being we have no perfect price formula to replace JCC,” said INPEX CEO, Toshiaka Kitamura. That said, the consensus at the conference was that change is now only a matter of time.

**Welcoming the Paris Agreement on climate**

Natural gas industry leaders have been very vocal about their desire for a strong international agreement on climate change, and at LNG 18 they celebrated the historic success of the COP 21 talks last December.

“The treaty signed by 195 countries in Paris is a fact,” said Total’s CEO, Patrick Pouyanné. “And for the energy world it should be considered not as a constraint but as an opportunity.”

Like other gas industry leaders, Pouyanné regards carbon pricing as essential to improving the competitiveness of natural gas over its great rival in electricity generation: coal.

Highlighting the switch that has been taking place from gas to coal in the electricity fuel mix of a number of countries in both Asia and Europe, Pouyanné said: “This is why I believe a carbon pricing mechanism is important. It will take time. It should be progressive. But what I have learned is that the best way to make ecological progress is to give the right economic signals to investors. We will take that pricing on board and we will invest accordingly.”

“The future for our industry is bright,” said Shell CEO Ben van Beurden. “The fundamentals are very strong – driven by things like the Paris Agreement, and the inexorable growth of population and of the demand for energy to improve livelihoods and lifestyles. But we cannot sit here and take it for granted. The future will not come to us; we have to make that future … We need to be out there much more as an industry – much more assertive, much more sure-footed.”

*Alex Forbes is an independent energy journalist and consultant who has been reporting on energy developments and analysing trends for three decades.*
IGU is born, 1931-1934
At 10am on June 2, 1931, the 68th Annual General Meeting of the UK’s Institution of Gas Engineers (IGE) and the first International Gas Conference opened in the Great Hall of the Institution of Civil Engineers in London. That afternoon representatives of Belgium, France, Germany, the Netherlands, Sweden, Switzerland and the UK, along with observers from Norway and the United States, held the first meeting of the IGU Council.

IGE President Harold E. Copp was elected as President of the 1st International Gas Conference and Fritz Escher as IGU President for the following three years. Pierre Mougin was appointed Secretary General with the Secretariat based in Paris.

Areas of technical study were allocated with Belgium, Czechoslovakia, France, and the UK tasked with looking at the development of different aspects of gas usage, respectively industrial, domestic and pricing; France with harmonisation of methods for testing gas appliances and the unification of certification standards; Germany with the coordination and guarantee of methods for testing gas manufacturing equipment; and Switzerland responsible for reporting on gas safety.

Contacts were established with the Joint International Committee for Tests relating to the Protection of Telecommunication Lines and Underground Ducts (CMI from its French initials) and the World Power Conference.

Canada, Czechoslovakia, Austria, Italy, Poland, the United States and Yugoslavia joined IGU during the first triennium.

The 2nd International Gas Conference and the first to be organised under IGU’s auspices took place from September 1-4, 1934 in Zurich, held in the Swiss Federal Institute of Technology.
The first French Presidency, 1934-1937
New topics of study were added including pipe corrosion and industry promotion. A group was also set up to agree a vocabulary of gas terms in English, French and German in order to produce a dictionary for sale. Australia became IGU’s latest member.

The 3rd International Gas Conference is held in Paris from June 12-16, 1937 in the Arts and Crafts Engineers Hall, attended by 526 delegates including the first woman, Madame J. Czaplicka, a gas engineer from Krakow in Poland.

Hermann Müller, former President of the Deutscher Verein von Gas- und Wasserfachmännern (DVGW) was elected President for 1937-40. SVGW’s offer to host the Secretariat in Zurich with Colonel Hermann Zollikofer, Secretary General of SVGW, as IGU’s new Secretary General was accepted.

The German Presidency, 1937-1940
Before the German triennium was cut short by the onset of World War II, IGU’s work included agreeing that the pricing committee be disbanded and the technical work programme streamlined into four areas: production (Germany), distribution (Switzerland), use (France) and promotion (UK). Hungary joined IGU in 1938. The 4th International Gas Conference was scheduled to take place in Berlin, June 18-21, 1940.

1940-1946
During the hostilities, Hermann Zollikofer maintained the IGU Secretariat in neutral Switzerland.

In 1945 it was decided to reorganise IGU and convene a Council meeting in London on June 5-6, 1946. This was attended by representatives of Belgium, Canada, Czechoslovakia, France, the Netherlands, Sweden, Switzerland and the UK. Wilfred Philpot of the Canadian Gas Association had a mandate to represent the American Gas Association (AGA), and Norway sent an observer.

Delegates elected Colonel Cyril M. Croft, President of the UK’s IGE, as IGU President for 1946-49. The statutes were reviewed and minor amendments made. The main changes were to remove German as an official language and allow the President to appoint a President’s Secretary as well as a Secretary General. Cyril M. Croft appointed the IGE Secretary, Dr Walter T. K. Brauholtz, to assist him and asked Hermann Zollikofer to carry on as Secretary General.

The first United Kingdom Presidency, 1946-1949
Relationships with CMI and the World Power Conference were re-established and IGU was granted observer status at relevant meetings of the Coal and Power Division of the UN Economic Commission for Europe (UNECE).

Denmark joined IGU as the 10th post-war member.

The 4th International Gas Conference was held in London, June 15-17, 1949 at the Institution of Civil Engineers.

Marcel Brabant of Belgium was elected President for 1949-52 and announced that Belgium would take over responsibility for the Secretariat, appointing Raoul Touwaide, Secretary General of the Association des Gaziers Belges, to succeed Hermann Zollikofer.

The Belgian Presidency, 1949-1952
International committees to study the harmonisation of performance tests of gas appliances and the development of gas utilisation were set up.

IGU becoming affiliated to the International Union of Technical and Engineering Associations (IUTA) and gaining observer status at meetings of the working party on long-distance gas transport of the Organisation for European Economic Cooperation (OEEC).

IGU welcomed West Germany, Japan, Norway, the Saarland (which had been separated from Germany after the war) and Spain as its newest members with Austria and Italy rejoining.
The 5th International Gas Conference was held in Brussels from June 16-19, 1952. A marketing exhibition was also organised with displays of printed matter and screenings of films made by gas companies.

Robert W. Hendee of the USA was elected President for 1952-55.

The first American Presidency, 1952-1955
The triennium’s work included the setting up of two new committees, one within IGU to work on compiling a new edition of the dictionary of gas terms, and one outside the Union’s framework, a research committee called Comete-Gaz.

International cooperation developed with the European Coal and Steel Community, the granting of consultative status with the UN Economic and Social Council and participation in a UNECE study of the European gas industry.

The 6th International Gas Conference was held in New York from September 27-30, 1955. This was the first time the event had been held outside Europe.

Dr-Eng. Mario Boselli of Italy was elected President for 1955-58.

The first Italian Presidency, 1955-1958
Committees studying new distribution techniques and the interchangeability of gases started work in 1956, followed in 1957 by one on safety in the utilisation of gas. It was also decided that year to leave marketing to Comete-Gaz. The committee for the development of gas utilisation was disbanded and Comete-Gaz set up an International Colloquium on Publicity. This body, under various names, cooperated closely with IGU and was ultimately brought back under the Union’s umbrella in 2006. A booklet was published to commemorate IGU’s 25th anniversary.

Romania and the USSR swelled the ranks of IGU’s membership.

The 7th International Gas Conference was held in Rome, September 25-28, 1958, in the headquarters of the UN Food and Agriculture Organisation.

The Council elected Bengt M. Nilsson of Sweden as President for 1958-61.

The Swedish Presidency, 1958-1961
The committee studying new distribution techniques was expanded to include transmission and to work on an edition of the new dictionary in Czechoslovakian, Polish, Romanian and Russian. Proposals were also made to reorganise the committee structure for future triennia to give a more complete coverage of all the issues in the gas industry.

IGU was approached by the gas committees of the UNECE and OEEC to work on projects they were undertaking.

Poland rejoined IGU in 1960 and Finland joined in 1961.

The 8th International Gas Conference was held at the Folkets Hus conference centre in Stockholm, June 27-30, 1961.

Jacob van Dam van Isselt of The Netherlands was elected President for the forthcoming triennium.

The first Dutch Presidency, 1961-1964
The triennium saw a new committee structure introduced. Hungary rejoined IGU and Hungarian and Swedish were added to the second edition of the dictionary.

Contacts were established with research organisations such as the European Gas Research Group (GERG, from its initials in French).

The 9th International Gas Conference was held in Scheveningen, September, 1-4, 1964. For the first time the number of delegates passed the 1,000-mark at 1,008.

The Council elected Georg Düwel of West Germany President for 1964-67.

The first West German Presidency, 1964-1967
IGU’s statutes were revised to restructure the Bureau. Additionally, the new statutes gave the Council rather than the President the power to appoint the Secretary General and made
DEA Deutsche Erdoel AG is an international operator in the field of exploration and production of natural gas and crude oil based in Hamburg. The company’s focus is on safe, sustainable and environmentally conscious exploitation of oil and gas. DEA has 117 years of experience working along the whole upstream value chain as operator and project partner. DEA is a fully integrated E&P company with a staff force of 1,400 employees. The company’s focus is on regions in which DEA’s competence can best be utilised.

One of Germany’s leading oil and gas producers
DEA is one of the leading oil and gas producers in Germany and operator of the country’s largest and most productive oil field Mittelplate. The company’s gas production from its onshore fields in Lower Saxony is about 1.56 billion cubic metres a year.

Strong production portfolio and promising development opportunities in Norway
DEA Norge has a solid and promising licence portfolio with assets in all major phases in every region of the Norwegian Continental Shelf (NCS). DEA has ownership interests in several producing fields, such as Gjøa, Snorre, Snøhvit, Knarr, Skarv, Njord and Hyme. DEA is operator of PL435, where the discoveries are planned to be developed with a subsea template.

40 years of activities in Egypt
In Egypt, DEA has produced over 650 million barrels of crude oil as an operator in the Gulf of Suez during the last three decades. The company operates the Disouq gas development project in the onshore Nile Delta and is partner in the West Nile Delta project which will make a major contribution to Egypt’s energy supply.

Gas Development in Algeria
DEA is partner in the Reggane Nord Project in the Algerian Sahara, which comprises six gas fields under development. Production is planned to start in 2017. The production phase of the project is expected to span more than 25 years.

E&P in the Danish North Sea
DEA has been active in Denmark since 1995 and producing oil in the Danish North Sea as a partner since 2003. The company has a share in the offshore fields Cecilie and Nini in the North Sea. In April 2016, DEA received two licences as operator in the western part of the Danish North Sea.

Growing with Responsibility

Embracing responsibility, increasing efficiency, and sustainable growth – these are the ingredients of DEA’s success story. The Mittelplate Drilling and Production Island at the edge of the Wadden Sea National Park in Germany is a good example of DEA’s approach towards the environment. DEA is currently producing more than 50 % of Germany’s domestic crude oil from Mittelplate and has been operating the field without any harmful influence on the nature reserve for 29 years now. DEA takes responsibility towards humankind and the environment in all its upstream activities – in countries like Germany, Norway, Denmark, Egypt and Algeria – every day.

Growing with Energy
provision for a Deputy Secretary General if required.

IGU membership increased with Pakistan and Iran joining and Yugoslavia rejoining.

The 10th International Gas Conference was held in Hamburg, June 6-10, 1967. As part of the preparations a conference logo had been designed which the Council liked so much it adopted for general IGU use. This went on to serve for 45 years – with a slight alteration in 2005 – until the current logo was introduced in 2012.

The Council appointed the IGE’s Secretary, Albert G. Higgins, as Deputy Secretary General in preparation for the Secretariat’s move to the UK and elected Alexei I. Sorokin of the USSR as President and Georges Robert of France as Vice President for 1967-70.

**The Russian Presidency, 1967-1970**

In 1968 the first LNG conference was organised by the US Institute of Gas Technology. IGU subsequently agreed to co-sponsor the event.

Cooperation began with Marcogaz.

Bulgaria and East Germany joined IGU and Turkey became the first observer member followed by India and Portugal.

The 11th International Gas Conference opened in the Great Hall of the Kremlin Palace in Moscow on June 9, 1970 and ran until June 12. For the first time an exhibition of gas equipment ran alongside the conference.

The Council appointed Albert Higgins as Secretary General. Georges Robert was elected President and Leslie J. Clark Vice President for 1970-73.

**The second French Presidency, 1970-1973**

Argentina became the first member from Latin America and Algeria became the first African member. To reflect this, the conference name was changed from “International” to “World”.

The technical committee structure was reorganised, with LNG and LPG made a full committee. Work on utilisation was divided between two committees and those for statistics and documentation were merged. A papers committee was set up to coordinate the technical programme of what was now the World Gas Conference (WGC).

Other developments included decisions to organise periodic symposiums between WGCs and to enhance cooperation with WEC.

The 12th WGC was held in the Palais des Expositions, Nice, June 5-9, 1973. A record 146 papers and reports were presented.

Leslie Clark of the UK was elected President and James W. Kerr of Canada Vice President for 1973-76.

**The second United Kingdom Presidency, 1973-1976**

The 1973-76 triennium was marked by the first oil crisis, which pushed energy to the top of the global agenda. Energy conservation became a key issue and IGU was invited to participate in the work of WEC’s new International Energy Conservation Commission.

On the membership front, Turkey ceased to be an observer, three new observers, Bangladesh, Iraq and New Zealand, were welcomed and Brazil became a statutory member.

The 13th WGC was held on London’s South Bank, June 7-11, 1976.

The Council accepted France’s offer to be the next host of the Secretariat and appointed Bernard Goudal as Deputy Secretary General.

James Kerr of Canada and Eric A. Giorgis of Switzerland were elected President and Vice President for 1976-79.

**The Canadian Presidency, 1976-1979**

Two task forces were set up, the first studied improved end uses of gases while the second studied energy conservation in the gas industry.

Work on the latest edition of the dictionary in nine languages (Czech, Hungarian, Polish, Romanian, Russian and Swedish for the first time with revised English, French and German) was completed.
IGU became one of the co-sponsors of the new International Gas Research Conference. Hong Kong joined IGU as an observer. The 14th WGC was held in Toronto, May 27-June 1, 1979. Eric Giorgis of Switzerland was elected President and Dr Christoph Brecht of West Germany as Vice President for 1979-82.

The second Swiss Presidency, 1979-1982
Alongside the work of the technical committees, two task forces operated during the Swiss Presidency. Preparations also started for a new volume of the dictionary covering a larger vocabulary in English, French, German and Russian. Membership further increased with Indonesia, Taiwan, Mexico and Venezuela joining, New Zealand moving from observer to statutory membership and Egypt becoming an observer. IGU turned 50 in 1981 but the celebrations were held over to coincide with the 15th WGC, which was held in Lausanne, June 14-18, 1982. Workshop and roundtable sessions were introduced to the programme for the first time. The Council elected Christoph Brecht of West Germany as President and John Kean of the USA as Vice President for 1982-85.

The second West German Presidency, 1982-1985
IGU established contacts with the World Bank. A new edition of the dictionary was published in Arabic, Italian, Portuguese and Spanish. The task force on global gas supply and demand became a permanent committee and Committee G (covering statistics, documentation and sundry questions) was split into two as its workload was increasing. Ireland joined IGU, Portugal moved from observer to statutory membership and Libya, South Korea and Thailand became observers. However, Mexico and Romania left. Munich was the venue for the 16th WGC, which was held in the city’s exhibition centre, June 24-27, 1985. The Council elected John Kean of the USA as President and Dr Herbert Richter of East Germany as Vice President for 1988-91. It also appointed Dr Jean-Pierre Lauper as Deputy Secretary General.

The second American Presidency, 1985-1988
An important policy of the second US Presidency was to emphasise the contribution natural gas could make to reducing air pollution. IGU needed to show that natural gas had an important role to play as the cleanest of the fossil fuels. A key initiative to reach out to developing countries which needed help to build their gas industries was launched, building on the cooperation already established with the World Bank. The People’s Republic of China and Malaysia joined the Union, Peru became an observer and South Korea moved from observer to statutory membership. The 17th WGC was held in Washington DC, June 6-10, 1988. Herbert Richter of East Germany was elected President and Luigi Meanti of Italy as Vice President for 1988-91. Jean-Pierre Lauper was appointed as Secretary General with the Secretariat to be hosted at the Swissgas office in Zurich.

The East German Presidency, 1988-1991
The 1988-91 Triennium saw political turmoil sweep Eastern Europe. German reunification forced changes to the planning for the World Gas Conference with Rolf Beyer of Ruhrgas becoming co-chairman of the 18th WGC with IGU President Herbert Richter. Cooperation started with the International Association for Natural Gas Vehicles. Cometec-Gaz was succeeded by a new association called Eurogas. North Korea joined IGU, Egypt moved from observer to statutory membership and Iraq left. Despite all the challenges, the 18th WGC was a resounding success with records set for
The first Conference of the Parties (COP) to the United Nations Framework Convention on Climate Change (UNFCCC) was held in Berlin in 1995. IGU was granted non-governmental organisation (NGO) status.

Estonia, Croatia and Ukraine became Charter Members, Bosnia and Herzegovina, Israel, Latvia, Lithuania, Qatar and Slovenia became observers and Brazil rejoined as an observer, while Colombia, North Korea and Peru left.

The 20th WGC was held in Copenhagen’s Bella Center, June 10-13, 1997. Along with the packed programme, the last hard-copy edition of the dictionary was launched.

Jacques Maire stood down as Vice President on becoming CEO of Gaz de France and Claude Détourné was elected Vice President in 1996. He went on to be elected President for 1997-2000, along with Hiroshi Urano of Japan as Vice President.

The third French Presidency, 1997-2000
IGU, WEC and WPC agreed to offer each other a stand free of charge in their respective exhibitions, and to extend standing invitations to address each other’s Council meetings. From 2000, IGU started attending the Council meetings of WEC and WPC on a regular basis.

Nigeria joined and Turkey rejoined as Charter Members; Belarus, Chile, Monaco and Singapore joined as observers; Colombia rejoined as an observer; and Bulgaria, Libya, New Zealand and Thailand left. Additionally, Brazil and Lithuania moved from observer to Charter membership.

The 21st WGC was held in Nice, June 6-9, 2000.

The Council elected Hiroshi Urano of Japan President and George H. B. Verberg of The Netherlands Vice President for 2000-03. John Meeder retired as Secretary General, Peter Storm took over from him with the Secretariat to be hosted by DONG, just outside Copenhagen.
The Japanese Presidency, 2000-2003

Three special projects were carried out in addition to the work of the technical committees and task forces.

Associate membership was introduced. Observer status was abolished with all observers becoming Charter Members. The new status of an organisation affiliated to IGU was introduced. The first agreement was signed with Intergas Marketing.

IGU was invited to address a plenary session during COP 6, Vice President George Verberg gave the presentation. IGU was also granted NGO status at the 2002 World Summit on Sustainable Development.

Membership grew significantly with Bolivia, Brunei, Cameroon, Greece, Kazakhstan, Oman, Saudi Arabia, South Africa, Trinidad and Tobago and the UAE joining and Thailand rejoining, although Chile and Colombia left. The first Associate Members were BP Gas, Power & Renewables, ChevronTexaco Overseas Petroleum, GDA, Naturgas Fyn, NUON, Ruhrgas, Shell International Gas Ltd, Total and Tractebel.

The 22nd WGC took place in Tokyo, June 1-5, 2003.

The Council elected George Verberg of the Netherlands President and Ernesto López Anadón of Argentina Vice President for 2003-06.

The second Dutch Presidency, 2003-2006

A new technical committee structure came into operation. There were also three special project teams and two task forces.

A panel of independent energy experts to advise the President, called the Wise Persons Group, was set up.

Membership continued to grow with Eurogas joining and Peru rejoining as Charter Members, although Bolivia left. There were 16 new Associate Members. The European Gas Research Group, Gas Infrastructure Europe, Marcogaz, NGV Global and Pipeline Research Council International became affiliated organisations.

Ties with WPC were strengthened, and IGU organised a natural gas session at the 18th World Petroleum Congress in Johannesburg in September 2005.

Arrangements were made to bring the International Gas Research Conference and Intergas Marketing into the IGU fold.

A secondment programme was launched with members invited to second a young staff member to the Secretariat in the next Triennium.

The 23rd WGC was held in Amsterdam, June 5-9, 2006, coinciding with IGU’s 75th anniversary.

The Council elected Ernesto López Anadón of Argentina President and Datuk Abdul Rahim Hashim of Malaysia Vice President for 2006-09.

The Argentinian Presidency, 2006-2009

There were four special projects undertaken during the triennium and two task forces were also set up. The standing committees were joined by the new IGU Marketing and IGU Research Conference committees.

International cooperation included a new relationship with the International Energy Forum (IEF). This led to the launch of the IEF-IGU Ministerial Gas Forum.

Membership developed further with Angola, Bulgaria, Equatorial Guinea, Macedonia, Timor Leste and Vietnam joining, and Libya rejoining, as Charter Members, although Hungary left; and there was a net increase of eight Associate Members.

The number of affiliated organisations swelled with the addition of the Energy Delta Institute, International Group of LNG Importers, International Pipeline & Offshore Contractors Association and the Russian National Gas Vehicle Association.

The 24th WGC was held in Buenos Aires, October 5-9, 2009. IGU’s Natural Gas Industry Study to 2030 was launched at the conference.

The Council elected Datuk Abdul Rahim Hashim of Malaysia President and Jérôme Ferrier of France Vice President for 2009-12.
The Malaysian Presidency, 2009-2012

A work group for sustainable development was set up together with three task forces: two looking at different aspects of human resources, and one looking at geopolitics and the gas industry.

IGU’s gas advocacy initiative was launched. As part of the communications strategy, new publications including Natural Gas Facts & Figures and the World LNG Report were launched.

IGU also teamed up with six gas associations based in Europe in a joint advocacy programme called GasNaturally.

The 25th WGC was held in Kuala Lumpur, June 4-8, 2012. The opening ceremony saw the launch of IGU’s new logo. There was also a youth programme for the first time, attended by 200 young professionals and students.

The Council elected Jérôme Ferrier of France President and David Carroll of the USA Vice President for 2012-15.

The fourth French Presidency, 2012-2015

Three task forces were set up looking at gas advocacy, geopolitics and human resources, and membership of the technical committees and task forces exceeded 1,000 for the first time.

IGU focused on establishing the Union as the Global Voice of Gas. IGU formed a relationship with the G20, joining the Energy Sustainability Working Group (ESWG). International cooperation also involved support for the UN’s Sustainable Energy for All initiative (co-chaired by IGU Wise Person Dr Kandeh Yumkella) and working with UNESCO. Memorandums of Understanding were signed with the World Bank, the International Peace Institute, UNECE, UNEP and UNESCO.

Membership grew strongly. Armenia, Azerbaijan, Albania, Bahrain, Côte d’Ivoire, Kuwait, Lebanon and Yemen joined, and Bolivia, Chile, Colombia, Hungary and Iraq rejoined as Charter Members. Eurogas moved from Charter to Associate membership and 17 new Associate Members joined although two existing ones left. NGVA Europe and the World LPG Association became affiliated organisations.

Important developments at the Secretariat are covered in the following articles.

A comprehensive review called “Building for the Future” was launched to ensure IGU’s proper positioning for the future. Eligibility for Associate membership was widened to allow all organisations with an interest in advancing the global gas industry to join IGU.

The 26th WGC was held in Paris, June 1-5, 2015 at the Porte de Versailles Convention Centre.

The Council elected David Carroll of the USA President and Jae Ho Song of Korea Vice President for 2015-18.

The third American Presidency, 2015-2018

The US triennium is focused on access, markets and social licence as the most important issues facing the gas industry. The distinction between working and programme committees in the standing structure has been dropped, and there are two task forces covering strategic communications and outreach and workforce development.

Two advisory groups have been set up, the Global Ambassadors Network and the Financial Advisory Board.

Advocacy and international cooperation has been stepped up with important events involving the G20, GasNaturally and the UNFCCC among others.

On the membership, front nine Associate Members upgraded to the new category of Premium Associate membership. Complimentary Premium Associate membership has been granted to Statoil and Gas Natural Fenosa as the current and future hosts of the Secretariat, and there has been a net increase of nine Associate Members.

Meanwhile, Phase II of the Building for the Future project looking at IGU’s event portfolio has been implemented.
An integrated approach for development of stranded gas

By Tony Bowman

From organisational structures to procurement strategies to new business models, the upstream exploration and production (E&P) industry is continually searching for ways to improve operational and financial performance. Many oil and gas projects have become so capital intensive and technically complex in nature that evolutionary or incremental changes in tools, equipment, software, and systems are no longer sufficient to achieve expected return on capital.

As an industry, we need to integrate services in field operations at the well site, along with technologies and engineering workflows back in the office. The ultimate integrated operation would be one in which both parties – oil company and service or technology provider – are fully aligned and work together as one.

Today we see a broad range of business opportunities related to integration, which we are actively evaluating, with each of them having different value propositions, technical challenges, and contractual structures. The first level of integration is where our specially trained project managers provide scheduling, planning, and activity coordination for the various Schlumberger product lines involved in a project. The next level of the offering is where we integrate a large part of our project management, engineering design, and technical optimisation capabilities when contracts are fully performance-based.

The highest form of integration is where we take full-field management responsibility using the complete Schlumberger knowledge base, workflows, processes, and technology offering. All the products, services, and personnel are streamlined and coordinated – across traditional domain boundaries – as a cohesive system with a single objective; maximise value.

Stranded Gas

One exciting opportunity for this type of approach lies in the area of stranded gas. Stranded gas fields are characterised by being too small or too remote for conventional development due to infrastructure, transportation, market access and/or financial barriers. Upwards of 40% of worldwide proven gas reserves can be classified as stranded either in smaller remote reservoirs or as the associated gas that is commonly flared off during liquids production.

An essential key aspect in developing any stranded gas asset is to build a tailored commercial framework that is equitable for all stakeholders. Key commercial variables are the reservoir life and associated agreement time frame; fiscal regime of the country or licence; capital and risk allocation between the participating partners; and market/monetisation point for liquid natural gas (LNG) production. There are various points during the value chain where the gas can be monetised on its way to the final consumer, with each monetisation point requiring additional capital by the project partners.

To address the operational, technical, field development, and cash flow challenges, Schlumberger has developed a cash-flow driven field development and management offering. We are convinced that our reservoir, well, and production system knowledge combined with floating LNG technology represents a compelling offering to address the stranded gas market globally.

Conventional LNG projects typically cannot meet the economic hurdles to develop stranded gas; however, innovations in floating LNG production facilities can significantly lower the capital investment and operating costs needed to bring these reserves to the market in an economical way.

This new and completely integrated approach is expected to reduce risk, reduce costs, and accelerate time to monetise stranded gas reserves and hence totally transform the economic viability of many stranded gas projects.
Greetings from Eldar Sætre, President and CEO of Statoil ASA

Statoil has been the host and sponsor of the IGU Secretariat since the transfer of the IGU headquarters from Copenhagen to Oslo on November 1, 2007.

IGU celebrates its 85th anniversary in 2016 and can be proud of its history and achievements in contributing to the success story of gas, initially manufactured (town) gas and later natural gas. Global gas demand has increased from 2,000 billion cubic metres (bcm) in 1990 to about 3,500bcm in 2015, and the share of gas in the global primary energy mix has reached almost 24%. Statoil believes in the further growth of gas in the global energy mix.

For more than 40 years, oil and gas have been produced on the Norwegian Continental Shelf, and over the decades Statoil has become the second-largest supplier of gas to Europe. The availability of natural gas for domestic and export markets has increased vastly in the past decade. This fact, combined with the environmental benefits that gas can offer, has made it clear that gas will play an increasingly important role in the transition towards a low-carbon and sustainable energy system worldwide.

The role of IGU has grown in importance in the wake of the 2015 COP 21 climate agreement to reduce global emissions of greenhouse gases. The gas industry is also contributing to reduced air pollution and improved living conditions for millions of families around the world. The recently agreed UN Sustainable Development Goals further emphasise the importance of access to clean energy.

IGU has become an important global communication channel, complementing the work done by Statoil and others. It has developed a close and active relationship with policymakers across the world, including with organisations such as the United Nations, the G20, the International Energy Agency and the World Bank Group. These institutions are highly influential when long-term energy policies are formulated at national, regional and global levels. It is important that IGU continues its dialogue with stakeholders outside our industry.

I am also pleased by the work of the IGU committees, at which industry experts come together to study technical and commercial issues along the whole gas value chain. The industry’s willingness to share competence and experience across borders is important to ensure continued growth for gas.

After nine years of host responsibility we hand the baton to Gas Natural Fenosa in Barcelona – the host and sponsor of the IGU Secretariat from November 1, 2016. I am confident that IGU will go from strength to strength under Spanish leadership, and wish Spain and IGU all the best for the future.

Eldar Sætre
President and CEO
Statoil
Greetings from Pål Rasmussen, Secretary General of IGU

Norway has been the proud host of the IGU Secretariat and home to the Union’s head- quarters for nine years during which we have experienced major changes and corresponding challenges in the business environment of the gas industry. IGU has had to respond to these challenges to ensure its relevance to members and fulfil its role as the global voice of gas.

There is still a lot of work to be done, but I am sure that the future development of the Union will be in good hands when Spain becomes the host of the Secretariat on November 1. Numerous initiatives have started and been implemented, and many of these now need to be taken from a strategic level to a tactical one. I wish Luis Bertrán Rafecas and his team all the best as they prepare to take over for the next six years.

The Norwegian term as host of the IGU Secretariat would not have been possible without the strong support of Statoil, and I would like all members to be aware of this. Statoil has been the largest contributor to IGU in the Union’s history, through the provision of office facilities, personnel and back office services over a period of nine years. But also very important in my view, Statoil has kept a distance to ensure its own and IGU’s integrity, and has not at any time tried to influence internal processes in IGU.

A commemorative brochure has been prepared for the Council meeting in Amsterdam that gives an overview of developments, achievements and initiatives that have been implemented during the Norwegian term, which has covered four Presidencies. I am proud to hand over to Spain in two weeks’ time and let me use this opportunity to thank those who have served alongside us during the Norwegian term:

◆ Council and Executive Committee members;
◆ The four Presidents and their teams;
◆ Members of the Coordination Committee and technical committees;
◆ The Regional Coordinators and members of the Wise Persons Group;
◆ All secondees who have served and are serving in Norway and the companies supporting them;
◆ All colleagues who have served and are currently serving in Norway;
◆ And last but not least all our members.

The Union is here to support the development of global gas markets and the global gas industry, through internal and external activities. The battle of preferred energy sources is taking place now, and IGU needs to be present in the relevant arenas where the decisions for the energy future are being made. I am convinced that natural gas is not a bridging or transition fuel, but an integral part of a long-term sustainable energy mix. I wish IGU every success in its future development.

All the best from Norway,

Pål Rasmussen
Secretary General of IGU
As we come to the close of the Norwegian term as host of the IGU Secretariat, we take the opportunity to reflect on and highlight developments that have taken place in the last nine years. In what was to become the longest tenure in the Union’s history the Norwegian Secretariat has worked with four Presidents, from Argentina, Malaysia, France and the USA, coordinating with them and assisting in developing the work of IGU with great success.

**Norway Becomes the Host of the IGU Secretariat**

The process that led to Norway becoming the host of the IGU Secretariat began in 2005 with a proposal from the Charter Member of IGU for Norway, the Norwegian Gas Association, with Norsk Hydro as sponsor. That October in Tianjin, China, the IGU Council elected Norway to take over from Denmark for a six-year term starting on November 1, 2007, based in Oslo.

In the run-up to the changeover, Norsk Hydro’s oil and gas activities were merged with those of Statoil while Norway’s original candidate for Secretary General, Petter Nore, stood down for personal reasons. Statoil became the sponsoring company and Torstein Indrebø the candidate for Secretary General.

Torstein Indrebø was elected by the IGU Council in October 2007 in St Petersburg, Russia and worked with the outgoing Secretary General, Peter Storm, to ensure a smooth changeover. Operations in Oslo began on schedule on November 1, 2007.

**Work under the Argentine Presidency, 2006-2009**

The transition took place during the first year of the Argentine Presidency of IGU under their theme “The Global Energy Challenge: Reviewing the Strategies for Natural Gas”. An important goal of the presidency was to make IGU into an effective voice for the promotion of natural gas in the global energy matrix. With the work and responsibilities of the Secretariat therefore set to grow, additional permanent staff were recruited and a second secondee also joined the team.

IGU’s secondment programme had been launched in October 2005 with the first secondee joining the Danish Secretariat in 2006. The programme provides an opportunity for IGU members to second young employees to positions in the Secretariat where they gain career development and a wider understanding.
Global Gas Award with the theme for 2012-2015 being “Sustainable development and innovative promotion of natural gas”. There were more than 500 submissions from which six finalists were selected to present their projects in a dedicated award session during the 26th WGC.

Regional Coordination within IGU

In 2009, IGU decided to strengthen its regional presence by appointing Regional Coordinators. Their remit is to increase knowledge about the regions within IGU, encourage existing mem-

of the international gas industry, while adding to the workforce capacity of the Secretariat.

Launching the IEF-IGU Ministerial Gas Forums

In 2008, IGU agreed with the International Energy Forum (IEF) to jointly organise a biennial Ministerial Gas Forum (MGF). IEF saw the need to enhance its involvement in natural gas and would bring in governmental representatives at the ministerial level from gas producing and consuming countries, while IGU would bring in the leadership of the private sector at CEO level to create a high-level forum for dialogue on matters related to natural gas.

The first MGF was hosted by the Austrian Government in 2008 in Vienna. Following the success of this event, IEF and IGU have continued their partnership by organising:

- The 2nd MGF in 2010 in Doha, Qatar;
- The 3rd MGF in 2012 in Paris, France;
- The 4th MGF in 2014 in Acapulco, Mexico;
- The 5th MGF in 2016 in New Delhi, India.

IGU Awards Programme

The IGU awards programme also started in 2008 with the Gas Efficiency Award of $10,000 calling for new ideas and projects that aimed at obtaining better efficiency in the use of natural gas. All IGU members were invited to nominate projects and 40 were submitted covering all parts of the gas chain. Two prizes were awarded and the overall winner was invited to the 24th World Gas Conference.

In 2009 the programme was extended with the Gas Efficiency Award joined by the Social Gas Award. This called for new ideas and projects to encourage people to use gas more efficiently. There was no cash prize but the winner was invited to the 24th WGC.

For the 2009-2012 Triennium there was a prize of $5,000 for each award and an invitation to the 25th WGC.

With effect from the 2012-2015 Triennium, the programme was refocused on a single
Highlights from the Norwegian Secretariat

with stakeholders outside the industry has been a key strategic development for IGU during Norway’s term as Secretariat host.

The benefits of gas, particularly its role in meeting the challenge of providing additional energy supplies and at the same time reducing emissions by replacing more polluting fuels, need to be communicated effectively to policymakers and regulators, non-governmental organisations (NGOs) and the general public.

Gas advocacy is now an integral part of IGU’s Vision and Mission and central to ensuring IGU’s messages reach targeted audiences around the world.

With partner gas organisations in Europe (Eurogas, GERG, GIE, GIIGNL, Marcogaz and the International Association of Oil and Gas Producers) a joint gas advocacy programme called GasNaturally was created, targeted the European Commission and Parliament with the aim of ensuring that natural gas was well represented in discussion of the future energy mix in Europe. The first event in the programme was a Member States Gas Forum in Brussels in February 2012.

Expanding IGU’s presence at the UN Climate Change Conferences

While IGU has been a recognised NGO at the annual Conference of the Parties (COP) to the...
United Nations Framework Convention on Climate Change since COP 1, as the issue of climate change moved higher up the international energy agenda, IGU decided to increase its presence at the conferences.

In 2009 at COP 15 in Copenhagen, Denmark, IGU organised a special gas event with high-level speakers from industry, policymaking bodies and NGOs. The event enabled IGU to interact with more delegates and media representatives and inform them about the environmental benefits of switching from more polluting fossil fuels to natural gas.

This concept for IGU’s COP presence was carried forward to subsequent events in Cancun, Mexico (COP 16), Durban, South Africa (COP 17) and under the French IGU Presidency in Doha, Qatar (COP 18) and Warsaw, Poland (COP 19).

Three more years
With such a period of major strategic development underway the IGU management asked if Statoil would be willing to extend the host term by three years as permitted by the Articles of Association. Statoil accepted the request, and at the IGU Council meeting in Dubrovnik, Croatia in October 2011 the Norwegian term was extended until October 31, 2016.

Moving forward under the leadership of France, 2012-2015
France once again held the IGU Presidency for the 2012-15 Triennium with a remit to promote the role of gas in the fuel mix to drive sustainable economic growth throughout the world.

Global Voice of Gas
The Global Voice of Gas project was launched as part of the the French triennial work programme, Major efforts and resources have been brought together to make IGU more visible, and to become a focal point of information on natural gas, in the global media. These are some initiatives of the project:

◆ Upgrading the IGU website to make it more dynamic and relevant;
◆ Creating a Global Gas Portal accessed via the IGU home page;
◆ Establishing an IGU presence in social media; Increasing exposure through interviews with press and TV journalists;
◆ Establish an IGU Communications Activities Calendar;
◆ Establish IGU policy statements;
◆ Issuing IGU policy statements;
◆ Issuing press releases ahead of targeted events;
◆ Delivering articles to magazines and background information to journalists;
◆ Create relationships with key global media houses;
◆ Publishing a monthly newsletter to provide information for members and other stakeholders; and
◆ Upgrading and standardising the IGU publications to make them more attractive to non-technical stakeholders.

Strategic partnerships
The development of strategic partnerships with selected international organisations has been one important area where IGU has strengthened its role as the global voice of gas, particularly during the French Presidency. With a defined strategy and cooperation with the right
IGU has also strengthened cooperation with other bodies. These include the G20 forum of major economies, International Energy Agency, International Energy Forum, Sustainable Energy for All and GasNaturally, as well as the IGU affiliated organisations.

Some examples of initiatives over recent years, all to support IGU’s increased focus on advocacy include:

**Cooperation with the United Nations and World Bank**

IGU has long been involved in energy discussions taking place in UN agencies and the World Bank Group. In recent years, the increased importance of gas in the global organisations, IGU has put itself in a better position to reach out to stakeholders around the world and advocate for natural gas.

Strategic partnerships have been build on many years of collaboration with different organisations in different arenas and, in a number of cases, have been formalised with a Memorandum of Understanding (MoU). IGU currently has MoUs with:
- World Bank Group;
- UN Economic Commission for Europe (UNECE);
- UN Environmental Programme (UNEP);
- UN Educational, Scientific and Cultural Organisation (UNESCO);
- International Peace Institute (IPI).

Delegates to IGU’s first gas competence seminar in Abidjan pose for a group picture. The seminar was opened by HE Adama Toungara, Côte d’Ivoire’s Minister for Mines, Petroleum and Energy (third from left in the front row, next to Torstein Indreba).

IGU’s partnership with UNESCO led to the organisation of a Workshop on Women in Engineering in Africa and the Arab States, held at the UNESCO headquarters in Paris in 2013.
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.

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.

We have drawn inspiration from nature to make the European gas network great.
In 2013, the Russian Presidency of the G20 set up an Energy Sustainability Working Group (ESWG) to support the global energy dialogue among the largest economies of the world. Following meetings between the Secretariat and the Russian Ambassador to Norway, IGU was invited to join the G20 ESWG and was the first NGO to do so. This offered IGU the opportunity to present the views of the gas industry to a unique global audience.

The first G20 Energy Sustainability Working Group of China’s Presidency. IGU has provided support on the topic of clean energy and co-hosted the G20 Natural Gas Day in June 2016.

The latest Oslo Diplomatic Gas Forum took place in December 2015.

G20

In 2013, the Russian Presidency of the G20 set up an Energy Sustainability Working Group (ESWG) to support the global energy dialogue among the largest economies of the world. Following meetings between the Secretariat and the Russian Ambassador to Norway, IGU was invited to join the G20 ESWG and was the first NGO to do so. This offered IGU the opportunity to present the views of the gas industry to a unique global audience.

The energy agenda has led to deeper and more formalised cooperation. Here are some examples of deliverables:

◆ Agreement was reached for IGU to jointly organise competence seminars to assist nations in sub-Saharan Africa to exploit their gas resources downstream for domestic economic and social development.

◆ The first seminar covering West Africa was held in Abidjan, Côte d’Ivoire in 2013.

◆ A second gas competence seminar covering countries in Eastern and Southern Africa was held in Maputo, Mozambique in 2015.

◆ In 2013, IGU partnered with UNESCO to organise a workshop on women in engineering in Africa and the Arab States in Paris, France.

◆ Cooperation with UNECE, which has 56 member countries in Europe, North America and the Caspian region. This is particularly relevant for the UNECE Group of Experts on Gas.

◆ The MoU with UNEP covers cooperation in the fields of climate change, energy access and energy efficiency.
The G20 cooperation has continued with the G20 Presidencies of Australia (2014), Turkey (2015) and China (2016).

**Diplomatic Gas Forums**

In 2013, the Secretariat invited all the diplomatic missions in Oslo to a forum addressing the role of gas in the future sustainable energy mix. It was a great success and similar events have since been held annually in Oslo.

The value of reaching out to local diplomatic representatives was taken on board by the IGU management and in 2015 the USA Presidency organised an IGU Diplomatic Gas Forum in Washington DC.

**A change of helm at the Secretariat**

In 2013, Torstein Indrebø informed IGU that he intended to retire from Statoil and step down as Secretary General at the end of November 2014. Pål Rasmussen of Gassco was elected the new Secretary General of IGU from December 1, 2014 at the Council meeting in October 2014 in Berlin, Germany, with the title of Honorary Secretary General being conferred on Mr Indrebø.

**The American Presidency, 2015-**

Two major events have so far taken place during the American Presidency, IGU’s advocacy campaign for COP 21 in Paris in 2015 and the G20 Natural Gas Day last June. Meanwhile the Building for the Future project continues to guide the direction of IGU’s evolution.

**Highlighting the importance of gas at COP 21**

IGU did not mount a gas event during COP 20, preferring to concentrate resources on preparing for COP 21 in Paris, France in 2015, during which a special report Case Studies in Improving Urban Air Quality was launched. The launch was backed up by a media campaign which resulted in coverage in key energy trade publications and a featured story in the Financial Times web and print editions highlighting the contribution of natural gas to improving urban air quality.

**Success at the G20 meetings in China**

In June 2016, a special G20 Natural Gas Day was jointly hosted by IGU and the National Energy Administration of China to explore the different ways that gas can contribute to a sustainable energy future. The event was held one day before the G20 Energy Ministers meeting and invited delegates to discuss global energy governance. How to advance efforts to...
said that IGU’s growing role in advocacy was of particular importance to them.

The BFTF project aims to ensure that IGU is properly positioned in the future, starting in the first phase by establishing a reliable means of funding strategic projects supporting gas advocacy globally, minimising dependence on sponsorships.

The first phase of BFTF was approved by the Council in June 2015 and with it the necessary changes to the Articles of Association. This introduced a new Vision and Mission statement and a new structure of membership fees and categories. The implementation of Phase I has put the Union in a position to ensure dedicated resources for advocacy, by engaging an Executive Director of Public Affairs and engaging an international PR agency.

BFTF then moved into Phase II looking at IGU’s event portfolio. The three prime events are the World Gas Conference, the IGU Research Conference and the LNG conferences (the latter co-owned with the Gas Technology Institute and the International Institute of Refrigeration). In April 2016, the Executive Committee approved proposals to strengthen IGU’s involvement in the planning and execution of the events by having greater input to strategic policy decisions, event branding and the conference programme, to create strong alignment to the Vision and Mission of IGU and to identify resources to support and follow up each event on behalf of IGU. Phase II has now been implemented by appointing an Event Director and establishing steering committees for the individual events.

The third phase of BFTF was initiated at the Executive Committee meeting in Durban in April 2016 to consider potential changes to the governance of IGU, both with regards to the Secretariat and the Presidency. Proposals will be considered by the Council, and the first presentation will be given during the Council meeting in Amsterdam in October 2016.

reach the targets of the COP 21 climate agreement was central to the discussions.

Building for the Future
In 2014, in light of the changes in global gas markets and the growth of the Union in recent years, IGU launched a comprehensive review called Building for the Future (BFTF). This was also in response to a membership survey that was conducted by the incoming USA Presidency in 2014, in which three quarters of members
A dedicated team led by the Secretary General, Pål Rasmussen with broad representation of members from all parts of the gas value chain has been developing the different phases, and all members who have been involved deserve credit for their contributions.

Membership development 2007-2016
During the Norwegian term, an active strategy for increasing membership has led to more members joining each year as shown in the chart (above) and coloured green on the map (below). In 2015, a major reform regarding...
Strengthening the financial capacity of IGU

Traditionally there have been two sources of funding for the IGU Secretariat. The host of the Secretariat has covered the cost of personnel and offices, which are the main overheads – and here special mention should be given to Statoil’s outstanding contribution as host of the Secretariat for the last nine years – while revenues from membership fees have covered operational expenses.

The significant increase in the number of members in recent years has allowed for modest increases in the IGU budgets, but financial limitations have hindered IGU’s ability to fulfil its ambitions as the global voice of gas.

In light of the need for more focus on external stakeholders in relation to climate change initiatives and a more active publication strategy, the IGU Council concluded in 2009 that the Union’s financial capacity had to be improved. It was decided to introduce a royalty scheme for the World Gas Conference from 2018. Royalties were subsequently introduced for the IGRC and LNG conferences.

The chart (below) illustrates the increase in IGU’s revenues to 2023 when the above reforms will have had their full impact.

As the hugely successful Norwegian term as host of the Secretariat concludes and we look forward to the new Spanish Secretariat, IGU is well-placed to lead the industry as its spokesperson.
Achievements and commitments

- A recognized experience in oil and gas industry
- An international oriented development
- A global pioneer in LNG industry
- A socially responsible company
- A committed human resource

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The IGU Secretariat is moving from Norway to Spain and the new Secretary General, Luis Bertrán Rafecas will take over from Pål Rasmussen on November 1. To mark the changeover, the IGU Magazine asked Pål about the major developments during his tenure and Luis about the challenges going forward.

Pål, since taking over from Torstein as Secretary General in December 2014 you have had an action-packed schedule. Could you give us the highlights of the Secretariat’s work over the last two years? I would like to specially mention: (1) the Building for the Future Project (BFTF); (2) the increased engagement with international policymakers in arenas such as the G20, COP and IEA; and (3) the development of the external advocacy efforts of IGU.

But I want to start by thanking all the staff involved in the work of the Secretariat who have really delivered their best over the last two years. Without their support all the changes we have initiated, along with our day-to-day operations, would not have been possible.

At the time I moved into the Oslo offices as Deputy Secretary General in early 2014, there was a lot of focus on improving IGU’s advocacy efforts. Following wide-ranging discussions, especially with David Carroll and Mel Ydreos, we decided to raise the bar and to take a broader approach. It was decided to gather several important strategic issues under the umbrella of BFTF.

◆ The Building for the Future project was established and divided into three phases. There was discussion of a fourth phase, which would have covered e-learning/education, but in the end we kept to three. Phase I was based on a clear message from our members to increase the focus on external advocacy. We started off by revising the Vision and Mission of IGU and developing a sustainable means of financing gas advocacy work by introducing a new structure of membership fees together with a new category of Premium Associate Member. The eligibility for Associate membership was widened and a strategy for strategic partnerships developed. Then, in Phase II, we looked at the conference portfolio and saw the need to strengthen IGU’s involvement in the planning and execution of the events as they are a major source of future income. Knowledge transfer was a key element in Phase II, which was approved at the Executive Committee meeting in Durban in April 2016. We are now working on the future governance of IGU under Phase III.
that I will make sure that the “lights are turned off” in a proper way in the Oslo office.

Regarding new tasks I have to say that so far my entire focus has been on IGU, on all the ongoing tasks and of course the transfer of the Secretariat to Spain. Only recently have I begun to think about my next moves. The starting point is that I am going back to Gassco A/S, who kindly made it possible for me to contribute to IGU by agreeing to my secondment. However, I have been asked by the new IGU management to continue IGU’s important relationship with the G20. I am also looking at possible areas of cooperation with Norwegian energy entities, and there might be opportunities internationally.

Time will show and I wish IGU all the best for the future.

Luis, you started work in the Secretariat in February. How have your preparations for the handover gone?

Well, really I started in December 2014 when I became Deputy Secretary General. I participated in the Building for the Future working group, preparing the changes under Phase I and then Phase II. In September 2015, my company Gas Natural Fenosa appointed me to IGU full time. Thus, I had greater involvement in the BFTF project, both in the decisions taken and their implementation. We decided to implement the new membership fee structure of Phase I in two stages, with 100% of the new fees becoming due from 2017. Phase II was approved during the Executive Committee meeting in April in Durban and is now being implemented to give us greater control over strategic policy, branding and the programmes of the flagship IGU events. The new position of Event Director has been created and we are working closely with the National Organising Committees of the events to ensure their successful development.

When I came to Oslo, I left a team in Barcelona preparing the Spanish office and support facilities and the procedure for the transfer of responsibilities. I have been managing this while...
Luis, could you introduce your team in the Barcelona Secretariat to us?
The team in Barcelona will continue to be an international one. As I said, Antonia Fernández Corrales will remain as Chief Adviser. This month, Rafael Huarte Lázaro has joined the IGU team full time as Director. Rafael Huarte is an engineer with an MBA and has a wide gas industry experience having worked in different parts of the value chain. He has international experience in business, strategy and development and has served as a member of the board of the Spanish gas association Sedigas. Also this month, Luisa Peris Meléndez has joined the IGU team as Executive Assistant. Luisa Peris has a degree in business management and a postgraduate degree in computing and multimedia. She has wide experience as a project manager working in areas including accounts, financial planning and retail and she also has international experience.

From Norway, Anette Sørum Nordal, who joined the Secretariat in 2013, will transfer to Barcelona to continue her role as Information Consultant and Secretary of the Coordination Committee. This will ensure good coordination with the USA Presidency.

From Korea, Taeksang Kwon, who was seconded to the Secretariat by KOGAS in 2015, will also transfer over. As Advisor and latterly Senior Advisor, Taeksang’s IGU experience includes the management of important projects such as the Gas Competence Seminar in Mozambique in September 2015. KOGAS is preparing to send Hyunchang Kim, with a degree in economics, as another secondee to the Barcelona office.

I would like to thank KOGAS for supporting the secondment programme which is of great benefit to IGU, the young people involved and their companies. The programme offers career development and a wider understanding of the international gas industry for the secondees, and adds to the workforce capacity of the Secretariat.

And finally there is Rodney Cox the IGU Event Director who, although he is not based in the Secretariat, will report to me as Secretary General and collaborate closely with the Barcelona team.

Luis, what do you see as the challenges for IGU going forward?
The main challenge is to continue the evolution of IGU through the BFTF project. As I explained, we will complete the implementation of Phase I in 2017 and with the full new fees we will further improve the service we offer to members and develop a new marketing plan. Secondly, under Phase II, we will continue to develop the IGU event portfolio, ensuring that IGU maintains best practices for event management. We will also continue developing relationships with strategic partners such as the World Bank, UN, etc. Thirdly, we will review the governance of IGU under BFTF Phase III to enhance the Union’s activities and performance as we advocate for natural gas as a key contributor to a sustainable energy future.

In parallel, we will ensure a smooth transfer of the Secretariat to Barcelona, prepare for the change of Presidency in 2018 after WGC 2018 in Washington DC and fully support the current USA and the next Korean Presidencies.
Message from the incoming Secretary General

The IGU Secretariat rotates less often than the Presidency but this November it is our turn to change. After nine years in Oslo, the Secretariat will move to Barcelona, to be hosted by Gas Natural Fenosa as agreed with enthusiastic applause at the Berlin Council meeting in October 2014. That means that we will change the office, the Secretary General and almost the entire Secretariat team.

We are very proud that Barcelona was chosen to host the IGU Secretariat. Barcelona has been a well-connected and outward-looking city throughout its history with a long tradition of hosting international institutions and events. The Spanish gas industry has a long history of involvement in international forums, including 65 years as a member of IGU, and aims to continue to contribute. Hosting the Secretariat recognises the efforts that Spanish gas professionals have made to support IGU and the industry, through their links to international markets and strong, constructive and trustworthy relationships. These efforts will grow in size and impact through the Secretariat.

IGU as a whole is undergoing a deep transformation that started in 2014 and was clearly defined with a new Vision and Mission in 2015. The aim is to enhance the value that IGU provides to members and through them to the societies where the natural gas industry delivers a vital service.

Maintaining the momentum of the transformation of IGU while we are moving the office of the Secretariat and taking over an important part of the team is a challenge which we assumed at the Berlin Council meeting. We started to participate in the activities of the Oslo Secretariat in October 2015 by seconding a staff member and, at the beginning of this year, I moved to Oslo to prepare for the takeover on November 1, 2016.

I would like to highlight the opportunity for members to second employees to work with us in Barcelona for a period of two years. I hope that the attractions of Barcelona, as a Mediterranean and cosmopolitan city, and the opportunity of working in the IGU Secretariat will encourage talented young professionals to join us.

IGU has arrived at its 85th anniversary with a proud record of supporting the growth of the gas industry, a growth which has made a great contribution to the economic development of the countries and societies of its members. I would like to thank the members of the Norwegian Secretariat, especially Pål Rasmussen the outgoing Secretary General, for their efforts and strong contributions. We will continue to push forward with the same spirit in Barcelona and advance their excellent work towards making IGU the most credible advocate of political, technical and economic progress of the global gas industry.

Luis Bertrán Rafecas is the Deputy Secretary General of IGU and will become Secretary General when the Secretariat transfers to Spain in November 2016.
Presenting IGU’s new Members

Following their introduction at the IGU Executive Committee meeting in Durban, South Africa, in April there was an electronic IGU Council session in May and five new Associate Members were approved. Here is a brief introduction to the companies.

Berkeley Research Group

The Berkeley Research Group, LLC is a leading global strategic advisory and expert consulting firm providing independent advice, data analytics, authoritative studies, expert testimony, investigations and regulatory and dispute consulting to Fortune 500 corporations, financial institutions, government agencies, major law firms and regulatory bodies around the world. BRG experts and consultants combine intellectual rigour with practical, real-world experience and an in-depth understanding of industries and markets.

BRG Energy provides business advisory and expert testimony services to energy industry participants, encompassing business, project, investment, regulatory and commercial advisory services, as well as expert services for dispute resolution matters including international arbitration, litigation and regulation. BRG works across the globe in support of clients in the natural gas and LNG industries, across all aspects of the value chain from the upstream through midstream and markets to downstream services. Their gas and LNG support work focuses on the impact of policy and regulation on market and economic analysis and the impact of industry changes on the business models and profits of market participants.

BRG wish to engage in ongoing dialogue with those who shape the gas industry, which is critical to their professional activities. BRG will seek to share insights into the evolution of the international gas markets gained from their work on behalf of industry clients, and to learn from the experiences of market participants across different areas of the gas and LNG value chain in order to develop the Group’s ongoing understanding of how gas markets are continuing to evolve. They feel that IGU (and the gas industry as a whole) can derive substantial benefit from encompassing a wide breadth of membership, including both those with physical assets and positions, and expert market analysts and consultants. The resulting cross-fertilisation of experience and expertise from all quarters of the industry will facilitate enhanced understanding of the past, present and future of natural gas and LNG. This will provide a solid foundation to advance the interests of an industry that is at the centre of BRG’s commercial and professional activities and interests. BRG wishes to play a part in this process to the best of their abilities, and consider that they have much to offer in this respect.

Through thought leadership and helping to advance knowledge of both the evolving dynamics of the gas and LNG markets in particular, and the global energy complex more broadly BRG seek to support and play an active role in the development of the gas industry. Ongoing developments such as the growing impetus towards decarbonisation and renewable energy integration present both substantial threats and opportunities, as such, the role of natural gas and LNG within the wider energy mix is more critical than ever to the future of
the gas industry. Through frequent contact with key figures as well as market-leading analytical work, BRG is well-positioned to help the industry to articulate this role and to secure its future as a leading source of energy.

BRG has interdisciplinary expertise across all aspects of the gas, LNG and energy industries. Their leadership team includes economic and market experts and accomplished regulators, engineers, and lenders who have played key roles in North American and international infrastructure development, financing, investment, operations and disputes focusing on gas and LNG. BRG expect to share their front line experience and observations with other industry participants via meetings, presentations, conferences and publications. They hope their contribution to the industry dialogue will help prepare industry decision makers to develop and communicate a compelling case for the critical role of natural gas and LNG in meeting energy, economic and environmental imperatives worldwide.

BRG is headquartered in Emeryville, California, with offices across the United States and in Asia, Australia, Canada, Latin America and the United Kingdom.

For further information, visit www.thinkbrg.com

**China Petrochemical Corporation (Sinopec)**

The China Petrochemical Corporation (Sinopec) is a state-owned, super-large petroleum and petrochemical enterprise group, established in July 1998 on the basis of the former China Petrochemical Corporation and headquartered in Beijing. Sinopec ranked third in the Fortune Global 500
in 2014 and is one of the top three gas suppliers in China. With especially strong ability in shale gas, its activities also involve both pipeline gas and LNG.

The Sinopec Group’s key business activities include: industrial investment and investment management; exploration, production, storage and transportation (including pipeline transportation), marketing and comprehensive utilisation of oil and natural gas; production, marketing, storage and transportation of coal; oil refining; storage, transportation, wholesale and retail of oil products; production, marketing, storage, transportation of petrochemicals, natural gas chemicals, coal chemicals and other chemical products; exploration, design, consulting, construction and installation of petroleum and petrochemical engineering projects; overhaul and maintenance of petroleum and petrochemical equipment; research and development, manufacturing and marketing of electrical and mechanical equipment; production and marketing of electricity, steam, water and industrial gas; research, development, application and consulting services in technology, e-business, information and alternative energy products; import and export of self-support and agent commodity and technology; foreign project contracting, invite bidding, labour export; international storage and logistics.

Aware of IGU’s role as the unique organisation for the world gas industry, able to facilitate gas development along the value chain, Sinopec applied for Associate Membership so that they can learn more from other colleagues and to be recognised as one of the major players by the industry. IGU membership provides a good opportunity for Sinopec to join in many activities including professional research and IGU’s leading international events to improve and enhance the Group’s strength. Sinopec have attended the World Gas Conferences in 2013 and 2015 and one delegate gave a speech in one of the LNG 17 panel sessions. Having made contributions in conventional, unconventional and LNG, especially in shale gas, Sinopec would like to take part in IGU studies to join in the exchange of ideas.

For further information, visit www.sinopecgroup.com

Edison S.p.A.

Edison SpA is Europe’s oldest energy company, having been founded over 130 years ago, and one of the industry leaders in Italy and Europe, integrated along the value chain of power and gas. The company operates in more than 10 countries around the world with a staff of over 3,000 in two main areas of business: electric power and hydrocarbons exploration and production (natural gas and crude oil). In Italy the company serves around 1.3 million business and residential customers, supplying power and gas alongside innovative energy efficiency services and solutions.

Since 2012 it has been part of the EDF (Electricité de France) group.

E&P

Edison is active in exploration and production of natural gas and crude oil, with 60 concessions and exploration permits in Italy and 66 abroad. The Abu Qir concession in Egypt represents a key asset and overall the company has 42 billion cubic metres (bcm) of hydrocarbon reserves.

A review of the E&P portfolio is underway in order to pursue selective development aimed at integrating power and gas activities along the value chain with efforts focused in Italy and the Mediterranean basin, and rationalisation of Edison’s presence in other countries, in line with EDF’s international strategy.

Gas imports and infrastructure

Edison has a diversified portfolio of long term gas import contracts, for a total annual volume
Poseidon projects are included in the list of Projects of Common Interest, the maximum level of European priority.

**Poseidon pipeline**
The Poseidon pipeline consists of a multi-source offshore pipeline project that will connect the Greek and Italian natural gas transportation systems. The project is designed to import 14 bcm/y of gas from sources available at the Greek borders, such as the Caspian, East Mediterranean and the Middle East. The project’s current design comprises a 207km offshore pipeline, that would cross the Ionian Sea at a maximum depth of 1,370m.

**EastMed pipeline**
The EastMed Pipeline is an offshore/onshore natural gas pipeline project that will directly link Eastern Mediterranean gas reserves with the European gas system. The pipeline is
The Linde Group

The Linde Group is a world leading supplier of industrial, process and speciality gases and leading engineering company in the field of gas technology. A success story that began with the separation of air, which was invented by company founder Carl von Linde, more than 135 years ago.

In the 2015 financial year, the Linde Group generated revenue of €17.944 billion, making it one of the leading gases and engineering companies in the world, with approximately 64,500 employees working in more than 100 countries worldwide. The Group comprises three divisions: Gases and Engineering (the two core divisions) and Other Activities (the logistics services company Gist).

The Engineering Division is a leading technology partner, focusing on natural gas

Interconnector Greece-Bulgaria (IGB)

The IGB pipeline will allow the connection of Bulgaria and other South-East Europe gas markets with complementary supply sources from the Caspian, Middle East, East Mediterranean and LNG (through existing/new terminals in Greece and/or Turkey). The project is designed as a bi-directional gas interconnector between Komotini (Greece) and Stara Zagora (Bulgaria) with an approximate length of 180km and a maximum capacity of 5 bcm/y.
Nitrogen removal and Helium extraction plants

Linde Engineering offers nitrogen rejection units (NRUs) with tailored process technology to ensure the highest efficiency and economics. The NRU portfolio includes single columns, single partitioned columns, double columns, and double columns with enrichment processes.

Nitrogen removal is typically combined with the recovery of helium if it is also present. High-purity helium is obtained by the combination of cryogenic and pressure swing- or temperature swing- adsorption process steps.

The benefit we see in IGU membership is that it is the most reputable global collaborative platform of large natural gas producers, distributors, marketers and users. IGU events and study groups help Linde to take the pulse of the market, understand fundamental developments and allows Linde to contribute with its expertise to promote the use of natural gas.

For further information, visit www.linde.com

Samsung Engineering

An interview with Choong Heum Park, CEO, Samsung Engineering.

What is Samsung Engineering’s core competitiveness in gas projects?

Samsung Engineering has executed more than 30 gas projects domestically and overseas, starting with the PTT gas separation plant in 1993. We successfully completed all projects through our project execution excellence and through our competitiveness in key process engineering.

Further, we showed our capabilities in gas projects through the successful implementation of PTT Public Company Ltd’s ESP and

Natural Gas Liquids extraction plants

Linde Engineering has longstanding experience in the design, development and construction of plants to recover Natural Gas Liquids (NGL) and Liquid Propane Gas (LPG). Due to their added value, heavier hydrocarbons such as NGL (C2+) and LPG (C3+) are often extracted from natural gas. Cryogenic processes are often the most economical way to separate these fractions. NGL consists of ethane and heavier hydrocarbons such as C2+, which is an ideal feedstock for steam crackers producing olefins.

LNG plants and terminals

Covering the entire LNG value chain, Linde Engineering has the know-how, capacity and technology to design and construct small-/mid-scale up to world-scale LNG production plants and LNG import terminals.
With gas processing as a main product, we try to identify technical characteristics through partnerships with major licensors, differentiate and optimise units as well as actively participate from the FEED stage on.

On the base of experience in successfully executing the Indonesia Banyu GOSP PJT, in which ExxonMobil invested, it was possible for Samsung Engineering to promote and expand our technology marketing to the upstream business, IOCs including oil majors.

Our major projects are executed in Southeast Asia and the Middle East, but we plan to expand globally in areas such as the CIS and South America in the near future.

We want to firmly establish our competitiveness in LNG and we already made a major step towards this by completing the FEED for the Texas LNG project in 2016. Further, Samsung Engineering wants to continue to improve our capabilities, by successfully executing the EPC for the Texas LNG project.

Samsung Engineering is honoured and humbled to be given the opportunity to join as the first EPC contractor in the IGU. With the IGU membership, we primarily anticipate strengthening our competitiveness in the gas industry through active networking and technology exchange. Therefore, we pay attention to recognise overall gas industry market trends and technical information in a timely manner and further identify key trends with the latest market and technology from the largest international conferences hosted by IGU. Especially, we are looking forward to expanding our network within the gas industry’s value chain, from governments, clients and organisations to vendors and related parties.

For further information, visit www.samsungengineering.com
Publications available from IGU

As a non-commercial organization promoting technical and economic progress in the gas industry worldwide, IGU offers its publications free of charge.

You are invited to download the publications currently available from the IGU website www.igu.org or order hard copies (if in stock) from the Secretariat (see Title page for contact information).

Reports launched in 2016
Case studies Enabling Clean Energies

Report launched at the IGU COP 21 Gas Day
Case Studies in Improving Urban Air Quality

Reports launched at WGC 2015
Biogas – from refuse to energy
Prospects for Natural Gas: identifying the key developments that will shape the gas market in 2050

Other publications
IGU Articles of Association
IGU Annual Report
IGU General Brochure
Triennial Work Program 2015-2018
Shale Gas – The Facts about the Environmental Concerns
Natural Gas as a Transportation Fuel

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
International Gas, back issues of the bi-annual IGU Magazine

Please check the IGU website for other (older) publications which are still available from the IGU Secretariat.
IGU Events and Other Major Gas-related Events 2016-17

October 18-21
IGU Coordination Committee, Executive Committee and Council Meetings
Amsterdam, The Netherlands
November 2-3
CH4 Connections 2016
Washington DC, USA
November 7-18
22nd Session of the Conference of the Parties to the UNFCCC (COP 22)
Marrakech, Morocco
2017
March 28-30
IGU Coordination Committee, Executive Committee and Council Meetings
Muscat, Oman
May 24-26
International Gas Union Research Conference, IGRC 2017
Rio de Janeiro, Brazil
October 24-26
IGU Coordination Committee, Executive Committee and Council Meetings
Tokyo, Japan

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LNG approaching critical mass as a globalising force for natural gas: LNG 18/Shane O’Neill/Oneill Photographics.

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Q&A with Pål Rasmussen and Luis Bertrán Rafecas: IGU.

Message from the incoming Secretary General: Gas Natural Fenosa.

Energy has a new name.

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ACCELERATING PERFORMANCE TO BECOME THE PRIDE OF THE NATION

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.