

Gastech

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DAY TWO

Wednesday, 5 April 2017

ADNOC chief touts strategic, value-added partnerships in promoting growth

KURT ABRAHAM, World Oil

Some key drivers are helping Abu Dhabi National Oil Co. (ADNOC) realize its ambitious growth plans, said His Excellency, Dr. Sultan Ahmed Al Jaber, UAE Minister of State and ADNOC Group CEO, during a ministerial address on Tuesday.

Among those drivers are technology and strategic, value-added partnerships, as the company seeks to ambitiously expand its business by opening new markets and offering new, diversified and high-value products.

Expanding on his partnership theme, Dr. Al Jaber said that the industry must collectively rethink its partnership models as a response to changing market dynamics. "In this new energy era, the success of our industry and our companies will be driven by long-term, value-added and integrated partnership models across the value chain, that leverage innovative technology and market access," he explained. "Such

integrated partnerships will require energy companies to think, plan and act differently to deliver future growth."

Focus on technology, relationships. Dr. Al Jaber emphasized that technology and partnerships are at the heart of ADNOC's growth strategy and five-year business plan. Those efforts are focused on driving efficiency, improving performance and maximizing value to deliver a more profitable upstream operation; a more valuable downstream sector; a more economic, sustainable supply of gas; and world-class talent.

"At ADNOC, we have set forth on an ambitious growth plan, and invite the industry to join us on our journey by shaping strategic partnerships that deliver technology, enhance market access and leverage value across our integrated upstream, midstream and downstream portfolio," he said.

"In particular," Dr. Al Jaber continued, "we see tremendous opportunity in capitalizing on emerging global downstream growth, which represents the fastest-growing segment of the energy industry."

Dr. Al Jaber said that ADNOC would work closely with industry partners that appreciate the scale of the opportunity, share the firm's values and are willing to take risks "in search of greater and stable rewards, as we aim to grow new markets and offer new, diversified and high-value products to those markets."

ADNOC's growth strategy encompasses increases in upstream capacity and downstream product portfolio expansion. The company's crude oil production is set to increase to 3.5 MMbpd by 2018. Meanwhile, sour gas output from the Al Hosn facility will be expanded by 50%. ADNOC is highly focused on its downstream business, and plans to triple production of petrochemicals and higher-value products.

Dr. Al Jaber noted that technology is enabling ADNOC's strategy, ensuring that the company maintains its competitiveness, grows sustainably and takes full advantage of market opportunities. "The development and application of innovative technology across the entire value chain of our business will be essential to driving efficiency and performance, and maximizing value from every barrel we produce. We are especially focused on applying enhanced oil recovery technology to

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His Excellency, Dr. Sultan Ahmed Al Jaber, UAE Minister of State and ADNOC Group CEO, said technology and partnerships are essential to future growth.

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Gastech organizer, Japanese government welcome delegates

ADRIENNE BLUME, *Gas Processing*

Christopher Hudson (FIG. 1), President of Energy for dmg :: events, kicked off Gastech in Tokyo with an organizer's welcome on April 4. Gastech 2017 is the 29th incarnation of the world's primary natural gas exhibition and technical conference.

Mr. Hudson thanked the Gastech 2017 Consortium, which includes Tokyo Gas, JERA, Mitsubishi Corp., Mitsui & Co., INPEX Corp., ITO-CHU Corp., Japan Petroleum Exploration Co. Ltd. (JAPEX), JX Nippon Oil & Energy, Marubeni Corp. and Sumitomo Corp.

He also acknowledged the hard work of the dmg :: events staff, the organizers of Gastech. He concluded by wishing attendees a successful, prosperous and effective week.



FIG. 1. President of Energy for dmg :: events, Gastech's organizing body, welcomed attendees at Tuesday's plenary session.

Following Mr. Hudson's remarks, Yosuke Takagi (FIG. 2), Japan's State Minister of Economy, Trade and Industry (METI), welcomed Gastech attendees on behalf of the Japanese government. He discussed Japan's important role in the evolving energy landscape, particularly in the LNG space.

The Japanese government is focusing on projects to increase the country's energy security and diversify its energy mix, particularly through the use of gas.

Mr. Takagi thanked the Japan Gastech Consortium members for bringing Gastech to Japan, and thanked the Gastech organizer for choosing Japan as its 2017 host country. ■



FIG. 2. Japan's State Minister of Economy, Trade and Industry, Yosuke Takagi, thanked the Japan Gastech Consortium for bringing the exhibition and conference to Japan.

Gastech

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ADNOC, continued from page 1

improve production levels and enhance value from our existing reservoirs."

Four pillars to enhance performance. Dr. Al Jaber said that four key pillars are supporting ADNOC's path to becoming a more commercially focused, performance-led organization: people, performance, profitability and efficiency. These pillars all tied to what he called "an unwavering commitment to HSE and asset integrity."

Tailoring his remarks to an audience of some of the world's most influential gas and LNG leaders, Dr. Al Jaber pointed out that Asia is an increasingly important market for energy producers, with its share of global gas imports growing from one-half to two-thirds of demand by 2040, even as global demand increases by 70%.

While advances in technology, combined with enhanced recovery techniques, are enabling producers to keep pace with the growth in demand, Dr. Al Jaber said that a lack of infrastructure investment must be addressed.

"Today, what is needed is better infrastructure that efficiently links producers to end-users," he said. "This will require nearly \$3 T in investment, according to the IEA, to upgrade the global gas distribution system

between now and 2040. That level of funding can only be achieved through creative, committed, long-term partnerships at every level, between companies and countries, and between the public and private sectors."

Driving customer value and future growth. Noting the UAE's and ADNOC's ties with Japan, the CEO called Japan one of his firm's "longest-standing partners and customers," and reminded attendees that ADNOC delivers one-third of Japan's oil and has been a reliable gas supplier for more than four decades. "Our experience with Japan is a clear example of how partnerships can advance industry, deliver economic growth and enable social progress."

ADNOC is driving efficiencies, enhancing performance and maximizing value for its shareholders, the UAE economy and society at large, added Dr. Al Jaber. Essential to this strategy is forging new partnerships throughout every aspect of upstream and downstream operations.

He concluded, "We invite all of you to join us on our very ambitious journey to push the boundaries of the possible, open up new frontiers and, together, drive the engines of prosperity." ■

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Cameron LNG Liquefaction Project under construction in Louisiana, USA

Conference Program—Wednesday, 5 April 2017

COMMERCIAL SESSIONS

08:45–09:45 How Energy Firms can Successfully Develop People and Projects for their Customers

- (Moderator) **Mary Hemmingsen**, Global Head of LNG, KPMG
- **Shogo Shibuya**, President and Chief Executive Officer, Chiyoda Corporation
- **Steve Hill**, Executive Vice President for Gas and Energy Marketing and Trading, Shell
- **Mike Utsler**, Chief Operating Officer, Woodside Energy
- **David Knipe**, Head of International Gas, IST, BP

Contracting, Pricing and Trading of Gas and LNG (Session 1)

10:00–10:20 Special Keynote Address

- **Jack A. Fusco**, President and Chief Executive, Cheniere Energy, Inc.

10:20–10:40 The International Gas Union 2017 Perspectives on the World LNG Industry

- **Elias Cortina**, Gas Market Advisor, Chevron and The International Gas Union

10:40–11:10 Networking Break

11:10–11:30 Japan's Pursuit of its Own LNG Hub

- **Hiroshi Hashimoto**, Senior Analyst—Gas Group, Institute of Energy Economics Japan

11:10–11:30 Surviving and Thriving in Japan's Future End-User Led Markets: Lessons from the European Experience

- **Luis Sanchez Marcos**, Head of LNG Trading, Uniper Global Commodities SE

11:50–12:10 In Defence of Take or Pay

- **Jason Bennett**, Partner, Baker Botts

12:10–15:00 PANEL DEBATE: United States LNG Exports—The Future?

- (Co-Chairman) **Andrew Walker**, Vice President of Strategy, Cheniere Marketing
- (Co-Chairman) **Noel Tomnay**, Head Global Gas, Gas and Power Research, Wood Mackenzie
- **Elizabeth Spomer**, President, Jordan Cove LNG
- **Octávio M.C. Simões**, President, Sempra LNG
- **Sunao Nakamura**, Senior Executive Vice President, Energy Transactions and Projects, JERA Co., Inc.

13:00–14:30 Delegate Networking Lunch

The Future for Gas in the New Dawn of Tighter Economics and Lower Carbon Emissions (Session 2)

14:40–15:00 The Global LNG Market in 2025—Size of the Prize

- **Noel Tomnay**, Head Global Gas, Gas and Power Research, Wood Mackenzie

15:00–15:20 India—Breaking the Mental Barrier and Giving Natural Gas its Due

- **Prabhat Singh**, Managing Director and Chief Executive Officer, Petronet

15:20–15:40 Market Outlook for Gas and LNG—The Key Growth Markets

- **Philip Olivier**, Chief Executive Officer, ENGIE Global LNG

15:40–16:10 Networking Break

16:10–16:30 Africa: The New LNG Importing Region?

- **Anne-Sophie Corbeau**, Research Fellow II, KAPSARC

16:30–16:50 The Challenges for New LNG Demand Creation

- **Ryosuke Tsugaru**, Chief Executive, Diamond Gas International Pte. Ltd (DGI)

16:50–17:10 The LNG Fuel Tipping Point and the Competitive Advantage

- **John Hatley**, Americas VP Marine Solutions, Wärtsilä

TECHNICAL SESSIONS

08:45–10:15 Stream 1: Gas and LNG Process Engineering: Control and Optimization

1. The Dynamic Measurement of Liquefied Natural Gas
 - **Pico Brand**, Global Product Manager, Krohne
2. cMIST™: Novel, Compact Dehydration Technology
 - **Shwetha Ramkumar**, Engineering Associate, ExxonMobil Upstream Research Company

1. First Field Trial of Regassified LNG Underground Storage: The Reproduction and Evaluation of Large-Scale Underground Storage Capacity of a Gas Field in Japan
 - **Tomoya Ohata**, Reservoir Engineer, Japan Petroleum Exploration Co., Ltd (JAPEX)
2. Operational Troubles in the First Middle East Underground Gas Storage Surface Facility
 - **Hasan Mohammad Hosseini**, Process Engineer, National Iranian Gas Company (NIGC)

13:00–14:30 Delegate Networking Lunch

3. Choosing the Right Nitrogen Rejection Scheme

- **Nicolas Chantant**, Natural Gas Treatment Process Specialist, Hydrocarbons Product Line

Stream 2: LNG Shipping—Containment

1. Introduction to KC-1 CCS (KOGAS LNG Cargo Containment System) for LNG Carrier
 - **SungJin Hwang**, Technical Sales Manager, KC LNG Tech Co., Ltd
2. The World's First Commercial LNG Fuel Tank Made of High Manganese Austenitic Steel
 - **Jiwon Yu**, Senior Researcher, POSCO
3. Structural Design and Construction Method for "Apple-Shaped Liquefied Natural Gas Cargo Tank" for LNG Carriers
 - **Michihisa Watanabe**, Structural Engineering Group/Nagasaki Ship and Ocean Eng. Dept., Mitsubishi Heavy Industries, Ltd.

Stream 3: Gas and LNG Storage and Containment—Onshore Tanks

1. The Best Remedy to Prolong Lifetime of LNG Storage Tanks: A Diagnosis and Overhaul for LNG Storage Tanks
 - **Chu Sung Son**, Manager, Korea Gas Corporation (KOGAS)
2. Effective Solutions for the Safe and Reliable Delivery of Large LNG Storage Tanks in the Severe Conditions of Northern Siberia
 - **Patrick Genoud**, Executive Vice President, Business Development, Entrepose Contracting; **Julien Castres Saint Martin**, LNG Business Development Manager, VINCI Construction Grands Projets
3. Shortening of LNG Storage Tank Construction Period, Using the Jack Climbing Method
 - **Hirotugu Tateishi**, Engineer, IHI Corporation

Networking Break

Stream 1: Gas and LNG Process Engineering—Liquefaction/Pre-treatment

1. Innovative Precooling Strategies for Efficient Natural Gas Liquefaction
 - **Gowri Krishnamurthy**, Senior Principal Research Engineer, Air Products and Chemicals, Inc.
2. An Improved Reliquefaction System for LNG Carriers
 - **Alan Duckett**, Director Sales and Technical, Energy and Marine Technology, Babcock LGE Process
3. LNG AGRU Designs for Feed Gases with Low CO₂ Content
 - **Torsten Katz**, Global Technology Team Manager, Gas Treating, BASF SE

Stream 2: LNG Shipping—Ship Design and Build

1. The Future of LNG Carriers—Probability of Further Upsizing and Fuel-Efficiency Improvements
 - **Takeshi Hashimoto**, Director/Senior Managing Executive Officer, Mitsui O.S.K. Lines, Ltd.
2. Inspection Plans for Gas Carriers
 - **Mark Corsetti**, Director, Global Gas Solutions, ABS
3. Yamal LNG—Shipping Design for Northern Russia
 - **Sergey Frank**, President and Chief Executive Officer, PAO Sovcomflot
4. From Concept to Practice: A Discussion of the Technical Development and Construction of the First Compressed Natural Gas (CNG) Carrier
 - **Sean Bond**, Director, Global Gas Development, ABS

Stream 3: Gas and LNG Storage and Containment—Underground

1. First Field Trial of Regassified LNG Underground Storage: The Reproduction and Evaluation of Large-Scale Underground Storage Capacity of a Gas Field in Japan
 - **Tomoya Ohata**, Reservoir Engineer, Japan Petroleum Exploration Co., Ltd (JAPEX)
2. Operational Troubles in the First Middle East Underground Gas Storage Surface Facility
 - **Hasan Mohammad Hosseini**, Process Engineer, National Iranian Gas Company (NIGC)

14:00–15:30

Stream 1: Gas and LNG Process Engineering—Heat Exchangers and Drivers

1. Electric Motor-Driven Compression System (eLNG) for the Freeport LNG Project
 - **Leonardo Baldassarre**, Engineering Executive, GE Oil & Gas
2. Brazed Aluminium Heat Exchangers for Liquefaction Process Optimisation
 - **Douglas Ducote**, Vice President, Process Plant Technology, Chart Industries
3. Making CNG Cheaper and 'Greener'
 - **Lev Tunkel**, Technical Director, Universal Vortex, Inc.; **Ross Gale**, Director of Sales, Universal Vortex, Inc.

Stream 2: LNG Shipping—Propulsion

1. Maintenance Support for TFDE Vessels in Port
 - **Richard Gilmore**, Director Gas Fleet, Maran Gas Maritime
2. Eco-friendly and Cost-effective LNG Solutions for LNG Carriers driven by New Propulsion Systems with Compact Re-Liquefaction System based on Mixed Refrigerants
 - **Kwang Pil Chang**, Researcher, Hyundai Heavy Industries; **Sang-Bong Lee**, Project Manager, Hyundai Heavy Industries
3. The Next Generation of LNG Carrier Designed by DSME
 - **Odin Kwon**, Vice President, Head of Ship Marketing Engineering & Basic Design Div., DSME; **Johan Petter Tutturen**, Vice President, Business Director Gas Carriers, DNV GL

Stream 3: Operations, Maintenance and Reliability

1. Development of a New High-efficiency Dual-Cycle Natural Gas Liquefaction Process
 - **Chang Lin**, Senior Engineer, China Huanghai Contracting & Engineering Corp.
2. The Innovative Approach to Improve LNG Terminals: An Assessment System for LNG Receiving Terminals
 - **Chahwan Kim**, Senior Manager, KOGAS
3. Initiatives to Reduce Environmental Impacts and Improve Energy Efficiency in an LNG Plant
 - **Abu Bakar Usman**, Senior Rotating Equipment Engineer, Qatargas

Networking Break

Stream 1: Alternate Energy Transportation and Storage

1. Large-Scale Hydrogen Storage and Transportation System
 - **Yoshimi Okada**, Principal Researcher, Chiyoda Corporation
2. Development of a Hybrid Electricity Supply System Using Marine Fuel Cells with LNG Reforming System
 - **Osamu Okada**, President, Renaissance Energy Research Corporation

Stream 2: LNG Shipping—Equipment and Handling

1. A New High Pressure Emergency Release System for Gas Transfer Arms
 - **Pablo A. Vega Perez**, Senior Process Engineer Gas & LNG, Shell
2. A New Reliquefaction System of MRS-F® (Methane Refrigeration System—Full Reliquefaction) for LNG Carriers with X-DF Engines
 - **DongKyu Choi**, Director, DSME

Stream 3: Gas Fired Power Generation—Engineering and Technology

1. High Flexibility Distributed Power Plant to Support Intermittent Renewable Power Generation
 - **Michael Welch**, Marketing Manager, Siemens Industrial Turbomachinery Ltd
2. Samsung Energy Plant: All-in-One Solution for Floating Power Plants with Gas-fired Combined Cycle Gas Turbines
 - **Myung-Kwan Song**, Principal Engineer, Samsung Heavy Industries Co., Ltd.
3. Improving Energy Efficiency with Cogeneration Technology
 - **David O'Brien**, Senior Consultant, Power Projects, ExxonMobil

International energy leaders call for cost-cutting, buyer-seller cooperation

ADRIENNE BLUME, *Gas Processing*

During Tuesday's plenary session, a panel of international energy leaders examined how gas suppliers are adapting to the changing global market.

The late-morning panel session was moderated by Wood Mackenzie Chairman and Chief Analyst Simon Flowers. Panelists included Chevron Vice Chairman Michael K. Wirth, ExxonMobil Gas and Power Marketing Co. President Robert S. Franklin, Qatargas CEO Khalid bin Khalifa Al-Thani, Total SA Chairman and CEO Patrick Pouyanné, ConocoPhillips Chairman and CEO Ryan M. Lance, and Woodside Energy Ltd. CEO and Managing Director Peter Coleman.

Mr. Flowers noted that the present LNG market is "not pretty," unlike the cherry blossoms currently blooming in Tokyo. "So, then, how does the industry work its way through these difficult times?" he asked.

A long-term view on collaboration. Chevron's Michael Wirth noted that his company holds a bullish long-term view of LNG. "Over a period of time, LNG supply will exceed demand, but that's not unusual" for large, consumer-driven industries, he said.

Over the short term, said Mr. Wirth, LNG supply will come online faster than demand will grow. "As we can all agree, the supply gap will confront us in the years that follow, if we don't sanction new LNG projects." However, beyond the wave of new projects coming online in Australia and the US, only cost-competitive projects are likely to receive approval. These projects will require the support of host governments, and producers will need to drive down costs to attract buyers.

"With technology, collaboration and ingenuity, we will solve these challenges," he said.

Cost-cutting challenges for producers. How the so-called "Golden Age of Gas" has evolved was the topic addressed by ExxonMobil's Robert Franklin. Based on provisional 2016 data, natural gas demand growth has averaged 6.5%/yr since 2011, led by the US with 8 Bcf/d of growth. By 2040, global gas consumption could rise to 515 Bcf/d, Mr. Franklin noted. However, gas trade has expanded just 1.5%/yr since 2011.

"These will be interesting times, as 16 MMt of new—and, in some cases, higher-cost—LNG seeks buyers in a market where prices are generally weak," the executive said. ExxonMobil remains bullish over the long term. "Those projects with the lowest break-even cost will have the best chance to move forward and deliver maximum returns, both for the seller and the buyer."

Qatar optimizes its LNG offerings. A fairly optimistic view was offered by Qatargas CEO Khalid bin Khalifa Al-Thani. "In terms of market evolution, it is clear that a transformation of the global LNG market is underway," he said. "New markets are emerging, and new technologies and applications are evolving."

The CEO also noted that the integration of Qatargas and RasGas optimizes the efficiency of Qatar's energy portfolio at a global level. The consolidation will enhance the company's ability to offer more flexibility and service to customers through a single interface, while continuing to address environmental concerns and reduce carbon emissions. It will also result in hundreds of millions of dollars in cost reductions.

Energy majors must continue to invest. Total's Patrick Pouyanné noted that, "Although we may be in a bearish mood on the producer side, there is potentially a very bright future for gas."

Energy majors like Total must continue to provide customers with clean, reliable, affordable energy, he said. To that end, Total continues to invest in large projects, such as Ichthys LNG in Australia and Yamal LNG in Russia, despite the volatility of energy prices. The company is also investing in a new onshore LNG project in the US, Driftwood LNG.

Smaller-scale LNG offers opportunity. Ryan Lance of ConocoPhillips touted recent developments in smaller-scale LNG. "We are working on small-scale and mid-scale LNG applications to make LNG more cost-competitive," he said.

For LNG projects both large and small, governments must maintain stable fiscal terms, develop stable regulatory regimes, and provide a level playing field to encourage the growth of industry, said the CEO.

Supply side poised to tighten. Woodside's Peter Coleman expects the LNG market to tighten sooner than expected. He pointed to 93 MMtpy of project deferrals from 2014 to 2016. Market uncertainty makes greenfield investment challenging, the CEO said.

Emerging markets now account for 5% of global LNG demand. By 2025, Mr. Coleman expects 142 MMtpy of new demand from emerging markets. "The LNG market is rapidly becoming more liquid and transparent, and there is room to negotiate more flexibility in contracts," Mr. Coleman said. "We need to have an open conversation about the conditions that caused a supply overhang in the market ... And we need buyers to do their part and help us create new markets."

Encouraging greenfield investment while reducing costs. Mr. Flowers then posed the question: "What must happen to encourage investment in greenfield projects?"

Pointing to three phases of investment, Mr. Coleman said that a buildout of brownfield projects will occur first, including the expansion of capacity at recently built greenfield projects. The second step is non-frontier greenfield projects, including the incorporation of new fields into existing infrastructure. The third step is frontier greenfield projects. These three steps will require different examinations of risk and varying financing structures, the Managing Director said.

Mr. Wirth opined, "Those projects that will be successful are the lowest

cost. If you remain bullish on long-term demand, then low-cost wins in the end ... It's about grinding out every bit of everyday operating cost possible, while still operating safely and reliably."

Mr. Flowers then asked the panelists what the industry is doing to develop new markets, to which Mr. Franklin replied, "I think the opportunities are out there. Our competition, historically, has been liquid fuels. As we move forward, our competition is becoming more complicated. We now have liquid fuels, some coal and some renewable fuels, too."

"We do have the opportunity to win in that market space," Mr. Franklin said. "But it must be at a lower price than we've seen in the last 20 years." ■



The executives at Tuesday morning's, "International Energy Leadership Panel Debate," shared their views on the state of the LNG market.

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Young Gastech: Shaping the industry's future leaders

This year's inaugural Young Gastech combines what were previously known as the Student Programme and the Young Engineers' Foundation.

The Student Programme was launched in 2006 in Abu Dhabi, and was so successful that it was continued in Bangkok, Amsterdam, London, Seoul and Singapore. The goal of the Student Programme has always been

to raise awareness of the diversity of career opportunities, and to provide an opportunity for students to connect with industry professionals. The Young Engineers' Foundation was launched in 2014 to support young energy professionals who will eventually become the industry's future leaders.

The core vision of both programs was to allow participants to learn from

and network directly with leaders in the gas industry. Merging these two programs enhances this effect by combining industry insight and learning with a richer peer networking experience, allowing each attendee to share ideas and learn from those at similar stages in their careers.

The full-day program features relevant and informative sessions, panel

discussions and breakout groups covering a variety of subjects, including career opportunities; applying for and finding the right fit with the right companies; exploring why companies struggle to recruit young talent and where the largest shortages emerge; developing the essential skills needed for success; and the evolving outlook on the natural gas and LNG climate. ■

WEDNESDAY, 5 APRIL

09:00-09:05	Welcome and Introduction from the Organiser
	■ Will Robson, Conference Director, dmg :: events
09:05-09:15	Welcome from the Chair
	■ Tatsuo Masuda, Chairman, FairCourt Capital
09:15-09:35	Energy Industry 101: What is it about and how does it work?
	■ Jonathon Peacock, Partner, Management Consulting, KPMG Australia
09:35-09:55	Outlook On The Current Natural Gas and LNG Climate
	■ Wen Wang, Consultant, Wood Mackenzie
09:55-10:30	The World of Career Opportunities in Energy—Where are the Largest Shortages Across the Industry and How to Engage With and Apply to the Right Companies For You
	■ Shiori Takayama, Deputy Manager, Oil & Gas Business Development, Mitsubishi Heavy Industries, Ltd ■ Takeshi Kato, Senior General Manager, NYK Line
10:30-11:00	Why Are Companies Struggling to Recruit Young Talent—And Where Are The Largest Shortages Across The Industry?
	■ Toshihiro Takahashi, Deputy General Manager, Human Resources Department, Japan Petroleum Exploration Co., Ltd (JAPEX)
11:00-11:30	Networking Refreshment Break

11:30-12:15	Essential and Desirable Skills for the Energy Industry to Get Ahead in Today's Energy Climate
	■ (Moderator) Jonathon Peacock, Partner, Management Consulting, KPMG Australia ■ Yuji Kikkawa, Strategic Planning Department, Energy Business Unit I & II, Mitsui & Co. ■ Daisuke Takauchi, General Manager, LNG and Upstream Business, Osaka Gas UK, Ltd ■ Toshiaki Takimoto, General Manager, Global Exploration Unit, New Ventures Division, INPEX CORPORATION
12:15-13:15	Today's Leaders Panel Discussion: Some of the Leading Figures in the Industry Share Their Insights
	■ Kazuhiro Yokoi, Senior Vice President, Fuel Transactions Group, JERA Co., Inc. ■ Katan Hirachand, Managing Director, Energy Project Finance, Société Générale ■ Paul Sullivan, Vice President, Projects, Steelhead LNG
13:15-14:30	Networking Lunch hosted by ExxonMobil
14:30-16:30	Problem Solving Interactive Roundtable: Students and Young Professionals Will Form Mixed Groups and Work Through a Problem Solving Task; Solutions Will be Presented at the End of the Session
16:30-17:30	Networking Refreshment Break
17:30	Conference Close

Modular is now

More and more industries are exploring the benefits of modularization and, as the Engineering Division of The Linde Group will be showing at this year's Gastech, the LNG plant engineering business is no exception.

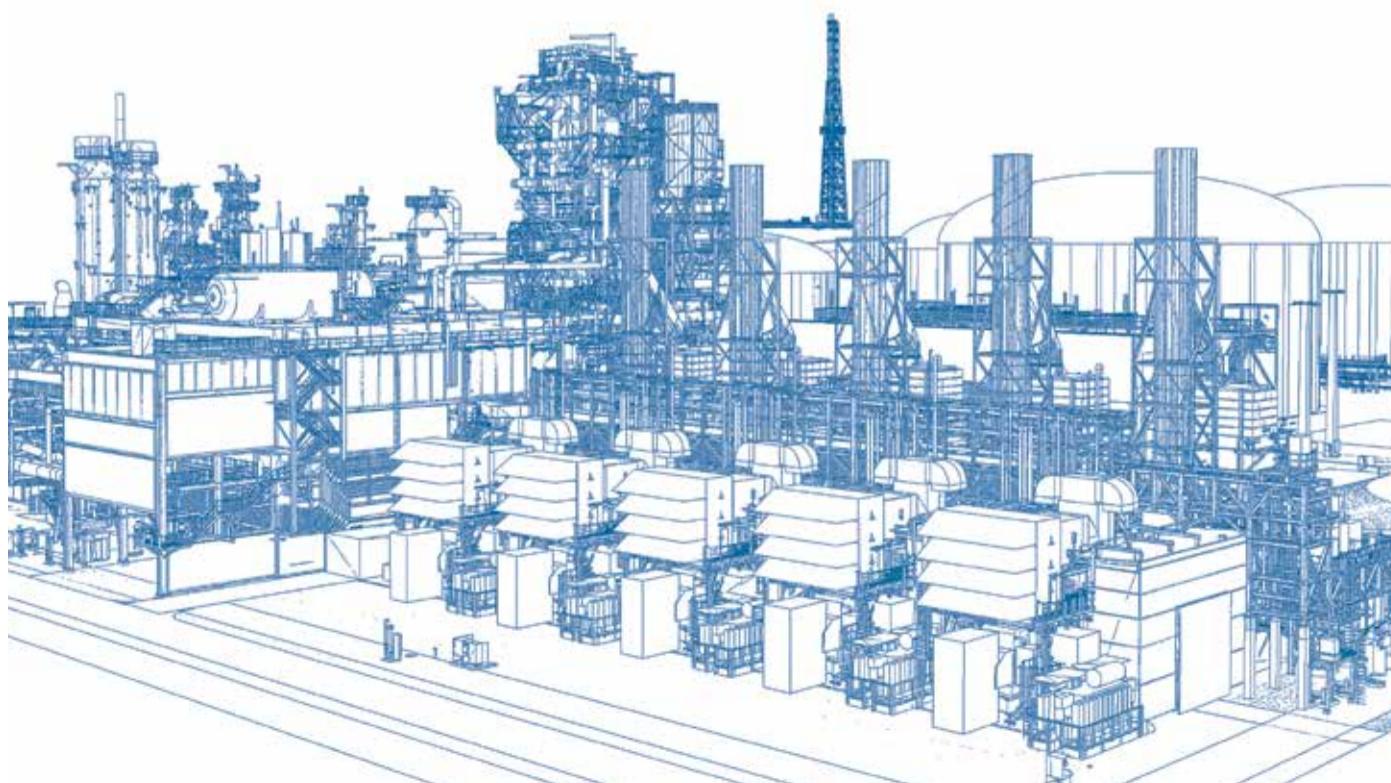
A modular approach to plant engineering entails converting process steps into building blocks that always fit together, can be freely assembled to create the required combination and always produce a predictable, stable result. This not only maxi-

mizes cost efficiencies and quality, but also reduces risk, complexity and onsite installation efforts thanks to offsite fabrication, preassembly and pretesting. Modularization continues to benefit operators once the system has gone onstream. Proven designs

improve operational efficiencies, and individual modules can be easily and cost-effectively replaced or updated.

A leading player in the LNG field, Linde will be taking its Gastech visitors on an exciting journey to the world of modularization. Guests of stand 12-160 in Hall 4 will see how the company is bringing the vast experience it has gained building world-scale LNG plants to the small- and mid-scale segment with its modular, ready-to-run production strategy. Visitors will even have an opportunity to take a virtual reality tour of an LNG plant. Guests can also learn how Linde is increasing the efficiency and flexibility of nitrogen capture through a variety of configurations scaling from single to double columns—all tailored to the composition of the natural gas. The company will be presenting its extensive service offerings and showcasing its range of proprietary equipment with plate-fin heat exchangers (PFHEs) and coil-wound heat exchangers (CWHEs) that set the standard for engineering excellence worldwide.

Meet the Linde experts at stand 12-160 in Hall 4. ■



ConocoPhillips discusses the latest technical innovations in LNG

Gastech had the opportunity to sit down with Gastech Governing Body Member Karl Masani, Director of LNG Technology and Licensing at ConocoPhillips, and ask for his thoughts on the latest technical innovations enhancing the LNG industry, ConocoPhillips' key projects utilizing the Optimized Cascade process, and where he sees the most attractive growth opportunities.

Gastech: What are the latest technical innovations enhancing the LNG industry pertaining to natural gas liquefaction?

Masani: For the most recent projects, either in operation or under construction, the LNG industry has primarily focused on maximizing the efficiency of the liquefaction process in the most cost-effective manner possible. The primary technical innovations pertain to the implementation of the most advanced and efficient aeroderivative gas turbine compressor drivers, such as GE's LM2500+G4 and the GE LM6000 PF, and the use of inlet air chilling. These gas turbines are among the most efficient in the world, enhancing and improving liquefaction economics, reducing emissions and providing high availability.

ConocoPhillips was the first to utilize gas turbines for its Kenai LNG facility in 1969, and was also a pioneer in implementing the first use of aeroderivative gas turbines for its Darwin LNG facility. Presently, 96 aeroderivative gas turbines are in operation or under construction as refrigerant compressor drivers at 16 LNG trains, utilizing the ConocoPhillips Optimized Cascade® process. Several LNG facilities at Curtis Island, Australia were the first to successfully implement inlet air chilling, which cools the air to a constant temperature prior to entering the gas turbine.

This element increases LNG production in high ambient conditions and effectively helps to maintain consistent annual LNG production. The combination of aeroderivative gas turbines and inlet air chilling have enhanced LNG production and increased efficiency to a new industry level.

Gastech: What are ConocoPhillips' key projects at the moment that utilize the Optimized Cascade process, and where does ConocoPhillips see the most attractive growth opportunities?

Masani: Worldwide, 25 liquefaction trains that utilize the Optimized Cascade process are either in operation or under construction, for a total combined capacity of more than 100 MMtpy (million tons per year). Our focus is on the construction phase for the Wheatstone LNG, Sabine Pass LNG and Corpus Christi LNG projects.

We see multiple growth opportunities in different segments of the LNG market, but two regions that are drawing a lot of interest are North America and East Africa. We are also developing a mid-scale LNG train design with a capacity of 1.5 MMtpy–2 MMtpy, and are working toward introducing it to the market in 2017.

Gastech: How and what can companies such as ConocoPhillips do to best future-proof their LNG liquefaction projects from major market downturns?

Masani: Future-proofing a multi-billion dollar LNG project is an exceedingly difficult task, but it can be accomplished to some degree if a stringent focus is maintained on key project variables apart from project cost and schedule. The design of a liquefaction project must maintain low cost while balancing

safety, high efficiency, high availability, low emissions, ease of operations and turndown flexibility. Keeping the liquefaction design simple without the use of excessive, stringent specifications leads to a cost-effective facility that can better adapt to a market downturn.

ConocoPhillips has been a pioneer in designing all its liquefaction units around a 2-in-1 concept, where a minimum of two gas turbines power each refrigerant compressor, providing exceptionally high plant availability and a low turndown close to 35% during adverse conditions. As an owner and operator of liquefaction facilities since 1969, we continue to take great pride in designing our liquefaction process to allow for operational flexibility and the ability to rapidly respond appropriately to changes in operating and market conditions.

Interest is growing in modular mid-scale LNG that can be installed and brought online in an incremental fashion as LNG demand increases. This not only reduces the initial capital cost and schedule, but also closely matches LNG supply with demand, thus lowering financing costs.

Gastech: How will the LNG industry develop in the next seven to 10 years?

Masani: We are facing a major downturn in the LNG industry due to low oil prices and an excess supply of LNG with several major projects that have commenced operations in Australia. Once demand catches up with supply, there may additional projects that will be developed in Canada, the US and East Africa. A lot of discussion is centered on modularized small-scale LNG, but the economics and viability have yet to be proven.

To visit with a member of the ConocoPhillips team, visit their exhibition at 11-080. ■



Karl Masani, Gastech Governing Body Member, and Director of LNG Technology and Licensing at ConocoPhillips.

PETRONAS TO EXPORT WORLD'S FIRST LNG FROM FLOATING PRODUCTION UNIT

The Petronas Floating LNG Satu (PFLNG Satu), sitting off the coast of Bintulu on Malaysia's Borneo island, has loaded LNG into the 144-Mm³ capacity LNG tanker *Seri Camellia*.

According to Thomson Reuters Eikon, PFLNG Satu's first export cargo is headed to South Korea.

The *Satu* facility, which is estimated to have cost as much as \$10 B, arrived in those waters last year, preparing for first operations. Other producers developing FLNG production facilities include Royal Dutch Shell: the company's \$12-B *Prelude* FLNG is building the world's biggest maritime vessel for use in Australia. Japan's *Inpex* is building a similarly big FLNG unit as part of the \$37-B *Ichthys* export project, also for use in Australia.

Both these hugely expensive projects have been plagued by delays, allowing Petronas to become the first company to produce LNG from a floating production unit. Huge development costs have led some to question whether FLNG units on this scale will be ordered again in future.

The LNG industry is undergoing huge changes as the largest ever flood of new supply is hitting the market, with volumes coming mainly from Australia and the US. This oversupply has resulted in a more than 70% fall in Asian spot LNG prices from their 2014 peaks to approximately \$5.50/MMBtu.

The *Satu* project's progress boosts Petronas' credibility as a firm able to engineer and execute cutting-edge projects. ■

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f t in C D G

Japanese antitrust scrutiny of LNG supply agreements

PAUL LUGARD, JAY ALEXANDER and SIMINA SUCIU, Baker Botts

The Japanese competition enforcement agency, the Japan Fair Trade Commission (JFTC), has recently begun investigating whether destination clauses in long-term LNG supply contracts with Japanese buyers violate Japanese competition law. The JFTC's investigation, which may affect both delivered ex ship (DES) and free on board (FOB) contracts, could have significant consequences, and may result in the forced renegotiation of LNG sale and purchase agreements (SPAs). It may also complicate the renewal of SPAs expiring in the near future and the negotiation of new SPAs. In addition, the JFTC investigation may trigger price review procedures or other dispute resolution mechanisms generally included in LNG SPAs. Finally, the Japanese antimonopoly law provides the JFTC with powers to impose administrative sanctions on the parties to anti-competitive agreements.

It cannot be excluded that other anti-trust enforcement agencies in the Asian region will follow the JFTC in subjecting LNG SPAs in their jurisdictions to antitrust scrutiny, as well.

Destination clauses included in LNG supply contracts provide that shipments of LNG must be delivered to the designated delivery point, prohibiting diversions or reloading/redelivery to another receiving terminal. The vast majority of LNG sold into Japan is supplied under long-term, take-or-pay contracts, with limited destination flexibility. In fact, it is believed that 80%–90% of these contracts include destination restrictions, requiring the buyer to receive and regasify the cargo at the designated destination point.

The JFTC investigation arises against the backdrop of the present over-supply of the Japanese LNG market—it is estimated that Japanese buyers will face an estimated surplus of 12.2 Bm³ of LNG in 2017 and 8.6 Bm³ in 2019. Eliminating destination restrictions would provide LNG buyers with more flexibility and opportunities to resell their LNG excess volumes, although regional arbitrage opportunities may be limited.



FIG. 1. The JFTC investigation arises against the backdrop of the present over-supply of the Japanese LNG market. Eliminating destination restrictions would give important commercial advantages to LNG buyers.

LNG MARKET CONDITIONS IN JAPAN

Prices and pricing trends.

Asian prices have traditionally been linked to international crude oil prices. High oil prices between 2008 and 2014 impacted Asian LNG import prices, which climbed to approximately \$18/MMBtu by mid-2012. While prices remained relatively constant through 2014, the Japanese LNG import price ultimately fell 78% to \$6.381/MMBtu in October 2016. Similarly, the average price of spot LNG for delivery in Japan decreased by 84% to \$7.90/MMBtu between 2014 and 2015. The average price of spot LNG for delivery in Japan dropped further to \$6.10/MMBtu in October 2016. International arbitrage opportunities, which were significant before 2015, have now greatly diminished.

Many LNG contracts in Japan are JCC-based, but Japanese LNG buyers are increasingly trying to move toward proposals with gas or LNG-specific price markers, such as the Henry Hub index, the Platts JKM (Japan Korea Marker), and combinations of JCC with JLC (Japan LNG Cocktail) or JKM.

The Japanese Ministry of Economy, Trade and Industry (METI) supports the gradual replacement of JCC-based pricing and has suggested establishing Japan as an international LNG trading hub by the early 2020s. In METI's view, this would involve replacing long-term LNG contracts with short-term and spot contracts, coupled with abolishing or relaxing destination clauses.

LNG demand in Japan is decreasing. The sharp increase in Japanese LNG demand that resulted from the loss of nuclear power generation capacity in the aftermath of the Fukushima disaster caused Japan to stand out as the world's largest LNG importer, accounting for 34% of the global LNG trade in 2015. Between 2011 and 2015, approximately 59 long-, medium- and short-term LNG contracts were concluded with Japanese buyers.

However, any assumption that LNG demand in Japan would continue to grow appears to be wrong. In 2015, Japanese LNG imports decreased for the first time since 2009. LNG imports were 4.7% lower in 2015 than in 2014, and dropped a further 6.2% between 2015 and 2016.

Several factors have been key in affecting Japan's LNG demand, including METI's policy initiative to expose the power and city gas sectors to more competition; JERA's strategy to bring its long-term offtake commitments down from 30 MMtpy–35 MMtpy in 2014 to 15 MMtpy in 2030;

and Japan's shift away from crude oil and LNG. While LNG accounted for 44% of Japan's energy mix in the beginning of 2015, METI's generation mix target for 2030 includes a 27% allocation for LNG.

In sum, Japan's energy generation mix appears to be changing significantly, with LNG demand falling. At the same time, Japanese LNG buyers, faced with over-supply and, in many cases, locked into take-or-pay contracts, are under significant pressure to reduce their LNG procurement costs. These factors, coupled with METI's policy initiatives, provide background for the JFTC's antitrust investigation into LNG destination clauses.

The origin of the JFTC's antitrust investigation.

The JFTC antitrust investigation appears to be supported by METI and at least some key Japanese LNG buyers. In May 2016, METI took the position that destination clauses in LNG contracts obstruct the evolution of a "flexible and liquid LNG market" in Japan (FIG. 1). In its view, the abolition or relaxation of destination clauses would trigger increased arbitrage selling, leading to lower prices. In the same vein, Japan's largest utilities (JERA, Tokyo Gas, Kansai Electric Power and Osaka Gas) support the removal of such clauses from their contracts to provide them with both greater flexibility regarding the use of purchased LNG volumes, and a better response to fluctuations in LNG demand.

We have seen this before: The EU's position on destination clauses.

Inspiration for the JFTC investigation may have come from the European Union. The European Commission has interpreted EU competition law to prohibit destination clauses that interfere with intra-EU trade. Therefore, destination clauses that prevent onward sales within the EU are considered to be unlawful restrictions of competition "by object" that are prohibited by Article 101 TFEU. However, as in many other areas of the law, it is difficult to import legal doctrine in the abstract, without regard to the underlying context and objective. In this case, the EU position on destination clauses is driven by the unique statutory obligation to protect intra-EU trade.

Japanese competition law and the JFTC's investigation.

The JFTC antitrust investigation is in line with and supports METI's LNG strategy. Judged by international standards, the JFTC investigation is in its early stages, but may proceed quickly. Recently, the JFTC requested that Japanese LNG buyers provide information

on whether clauses can be changed, the terms of delivery and the number of cargoes received since 2013.

The JFTC has also started to reach out to prominent LNG suppliers, and has sent Requests for Information to a number of them. Subject to the JFTC's discretion, responding to such Requests for Information can be either voluntary or mandatory. In practice, it is generally the former. Depending on the course of the antitrust investigation, and before any finding of anti-competitive activity, the JFTC may request additional information from the investigated companies.

The JFTC investigation will assess whether destination clauses qualify as "unfair trade practices" under the Japanese competition rules, in particular the Japanese Antimonopoly Act No. 54 of 1947, and the Fair Trade Commission Public Notice on Designation of Unfair Trade Practices No. 15 of 1982 ("Notice"). If destination clauses are held to violate Japanese competition law, the consequence for existing agreements could be significant. In this regard, the JFTC has the power to issue cease-and-desist orders, which may include injunctive relief or the instruction to delete destination clauses from LNG contracts.

What does the JFTC investigation mean for LNG exporters to Japan? It would be unprecedented for the JFTC to declare destination clauses included in LNG supply contracts unenforceable. However, if the JFTC does so, the possibility exists that its decision could lead a party to an LNG SPA to trigger various contractual rights, including Force Majeure, price adjustment and more.

In any event, such a finding could materially impact the commercial balance reflected in LNG contracts, could raise complex issues regarding the enforceability of those supply agreements, and could, at minimum, trigger complex discussions regarding alternative pricing mechanisms, diversions, reload opportunities and other contract terms found in LNG SPAs. Obviously, the JFTC's position may affect both existing and future supply contracts. On a more fundamental level, any such intervention may negatively affect Japan's credibility as a reliable trading partner.

It remains to be seen whether the JFTC will continue to aim for a head-on collision with LNG suppliers, leave the status quo or steer towards negotiated settlements intended to provide Japanese buyers with increased flexibility.

To learn more about Baker Botts' Energy, Antitrust and International Arbitration Practices, visit www.bakerbotts.com.

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Must we comply with both IMO and EU MRV?

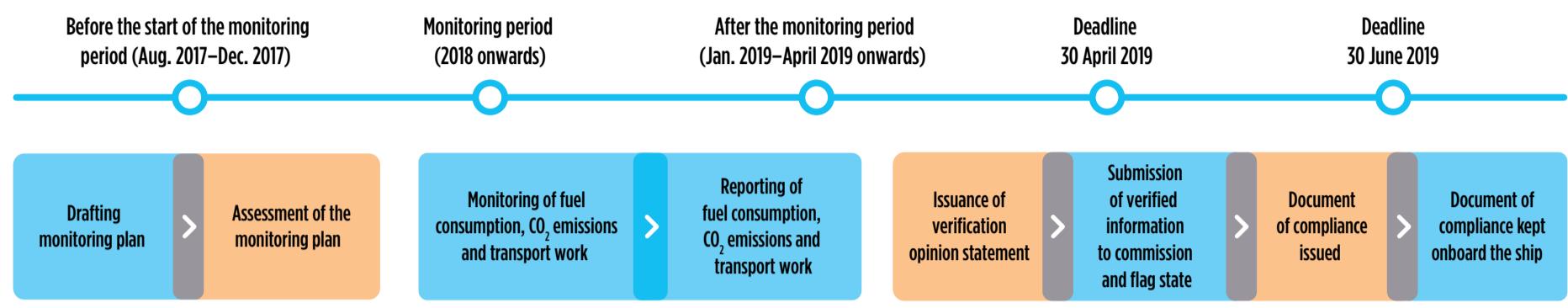


FIG. 1. The EU MRV regulation process, highlighting the important deadlines.

Eniram, which provides the shipping industry with energy management and vessel performance systems, stated recently that the European Union (EU) Monitoring, Reporting and Verification (MRV) regulation was once perceived as something that was on the distant horizon. Things have since begun to heat up, and some of the requirements under the EU regulation must be complied with in 2017.

After the EU set itself on a clear path towards the MRV of carbon dioxide (CO₂) emissions from ships, the International Maritime Organization (IMO) embarked on a similar mission with similar objectives. While the EU MRV regulation (FIG. 1) focuses on emissions from shipping activities within Europe, the IMO's vision is global.

In recent years, IMO member states have made significant progress toward addressing greenhouse gas (GHG) emissions from international shipping. Using data from its CO₂ data collection system, which is expected to record CO₂ emissions data from across the global fleet, the IMO—in the spirit of the Paris Memorandum of Understanding (MoU)—plans to include CO₂ reduction objectives for the entire shipping sector. This is due for adoption in 2018. As a sign of commitment, three additional intersessional meetings have been specifically approved to move this forward.

The EU regulation 2015/757, also known as the MRV regulation, entered into force in July 2015. The aim was to better understand the

consumption of fuel and CO₂ emissions from maritime transportation within Europe, and to ultimately use that information toward any future GHG reduction programs. The full details of how the EU regulation will be implemented are being worked out by the European Commission.

It goes without saying that while the IMO system must be complied with globally, all ships (irrespective of flag in EU ports) must also be in full compliance with the EU MRV regulation. Therefore, individual vessel data must be sent directly to the European commission. It is important to understand the salient differences between the two:

- Reporting: The EU MRV regulation involves far more detailed reporting compared to the IMO equivalent.
- Verification: Unlike the IMO, which relies on recognized organizations (mainly classification societies), the EU follows the path of verifier bodies authorized by national accreditation bodies that are associated with the EU emissions trading system.
- Data: The European Commission, as required by EU regulation, intends to publish and be transparent with the information it gathers, including every ship and company identifier. The IMO, on the other hand, intends to keep all information anonymous.

Some IMO member states fear that the EU may use this data to set

baselines, benchmark performance or install an efficiency index that could be unfair to some ships, particularly if these are based on data that may not be pertinent to a vessel's actual efficiency or CO₂ emissions. The fact that the EU data is publicly available could be disruptive. Data can be used by third parties, and the concern is that publicly-available, detailed and sensitive data could be misused, impacting commercial markets.

The anonymous nature of the IMO's collected data is specifically intended only to ascertain global CO₂ emissions from international shipping. It is generally accepted that this data will facilitate better policy decisions and explore the need for further reductions in GHG emissions.

Can these regulators coexist?

A consensus in the shipping community asserts that two similar regulatory regimes are not needed, and have become a nuisance. Some believe that perhaps it is better if both systems can be aligned and accepted globally. Uniformity in regulation will mean ease of compliance and a level playing field across the globe.

Whether at the IMO or the EU, regulators must keep in mind that the fewer the regulatory constraints, the easier it is for shipping and, therefore, the cheaper it is to receive goods across the world. Automating the entire MRV process will be a leap forward not only in reducing the administrative burden, but also in avoiding the red tape in monitoring and enforcing compliance. ■



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SHELL PLANS TO DOUBLE HAZIRA LNG PLANT CAPACITY

Royal Dutch Shell Plc plans to double the capacity of its LNG import facility at Hazira on India's west coast to 10 MMtpy. Shell Gas B.V., a unit of Royal Dutch Shell Plc., owns a 74% stake in Hazira LNG Ltd., while Total Gaz Electricite France, a unit of France's Total SA, holds the remainder.

Shell also opened a new technology center in Bengaluru, the capital of the southern state of Karnataka. The technology hub, Shell's third, will expand the company's research and development activities in Asia.

India aims to raise the share of natural gas in its energy mix from 6.5% to 15% in the next three years, as it strives for energy security while keeping pollution levels down. According to government data, India's gas imports from April 2016 to February 2017 rose 16.4% to 22.53 Bm³. ■

Removal and recovery of natural gas liquids

AJAY BADHWAR, Dow Chemical Co.

Natural gas streams often contain varying levels of natural gas liquids (NGL), which can hold significant value for operators, sometimes outweighing the value of the methane to be recovered. Previously, if the goal was to generate a separate NGL stream or simply exclude NGL from contaminating a process, a large-scale, high-cost cryogenic, refrigeration or other low-temperature unit was required to separate out NGL.

The Dow Chemical Co. is a leading provider of chemistry and technology to remove contaminants from gas streams. The company's global network of process engineers supports plants designed in one geography and installed in another. With Dow, you can benefit from unsurpassed application knowledge to help meet your gas treating requirements, reducing your CAPEX and OPEX.

Dow offers operators a lower-cost, value-added option, particularly for small-scale gas treatment: UCARSORB™ NGL Adsorbents. This highly selective system is designed to allow water, CO₂ and light NGL to slip through the bed, removing and capturing only targeted NGL. UCARSORB NGL Adsorbents are tailored for removal of heavier NGL at varying gas inlet conditions. Adsorbents need minimal operator intervention and

offer a small footprint, a low-pressure drop across the system (< 5 psig), and low capital and operating expense at a minimal electrical demand.

UCARSORB was developed using polymeric beads with high surface area to adsorb NGL compounds, removing C₃+ hydrocarbons from gas streams. Tested successfully in the field in 2016, Dow offers technical service with UCARSORB simulation capabili-

ties to model your present and future gas treating needs (FIG. 1). Dow offers advanced access to a state-of-the-art pilot plant that can mimic unsteady-state adsorption behavior, ongoing analytical support from a laboratory in your geographic region, along with experienced onsite technical service engineers for consultation.

Using in-house advanced simulation capabilities, Dow can accurately pre-

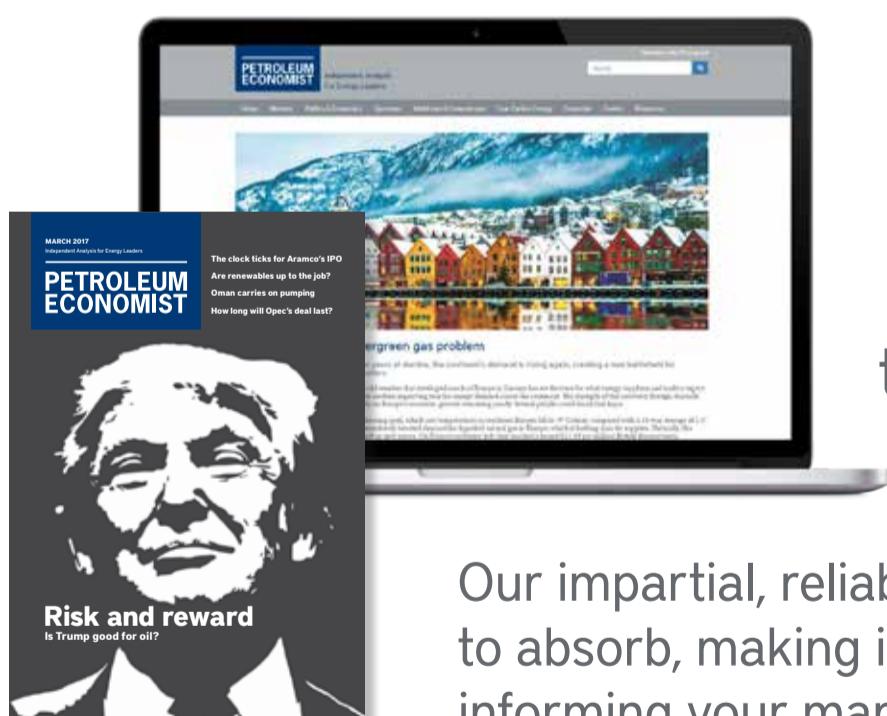
dict the performance of UCARSORB, including material balances, NGL production and system sizing.

Dow is committed to the success of our customers through chemistry and continuous innovation. To learn more about our products, innovations, technologies and other Dow services, please visit our exhibition at Gas-Tech (6002) in Hall 6, or visit www.dowoilandgas.com. ■



FIG. 1. Dow's global network of process engineers supports plants designed in one geography and installed in another.
Source: Dow Chemical Company.

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Asset care is more than mere inspection

Acknowledging the importance of pre- and post-inspection measures for sustainable, safe, efficient and reliable operation, the ROSEN Group has unveiled three new solutions.

ROSEN Cleaning EcoSpeed Service: Slow down for optimal performance. A pipeline's performance can be hindered significantly by the reduction of its internal diameter. The optimal speed for cleaning performance is below 5 m/sec. Since high-velocity gas pipelines transport medium at approximately 8 m/sec, this becomes a challenge.



FIG. 1. ROSEN Cleaning EcoSpeed Service—Optimal cleaning speed at regular gas flow.

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The tools used for the ROSEN Cleaning EcoSpeed Service (**FIG. 1**) are equipped with a unique speed reduction valve that enables them to slow to speeds of between 3 m/sec and 5 m/sec, while maintaining regular gas flow. This function ensures optimal cleaning without requiring a corresponding reduction in product throughput.

Cleaning Analytic Service: Run data that builds confidence. During a cleaning run, data is typically not captured regarding the type, volume or nature of

debris removed during the process. This means that operators are missing tangible information regarding their pipeline conditions. To ensure confidence in both the cleaning program and pipe conditions, ROSEN has introduced its Cleaning Analytic Service. Various packages allow for a more proactive approach to maintenance by collecting valuable data during the cleaning program and cataloguing it for future use (**FIG. 2**).

ROSEN CGA^{pro}: Expose active threats. The complex nature of corrosion has compelled inspection and integrity specialists to continually advance technology, improve knowledge and build experience in corrosion management. Corrosion growth assessments (CGAs) locate, and identify the cause of corrosion activity in a pipeline, and then quantify its rate. ROSEN's offering, CGA^{pro}, addresses the industry need with a holistic integrity solution for corroded pipelines, preparing operators with details of how corrosion has developed over time, thereby significantly increasing confidence in the future integrity of pipelines.

Recently, efficient asset integrity management (AIM) has become increasingly important within a wide range of industries, such as oil and gas, energy, process, mining, manufacturing, telecommunications and transportation. Operators must comply with legal standards and safeguard people and the environment, while gaining maximum profit from assets as diverse as pipelines, tanks and vessels, among others.

The first stage of CGA^{pro} is a thorough investigation of all available pipeline data, conducted by experts in integrity and corrosion management, risk and reliability, and flow assurance. The result is a complete corrosion diagnosis, leading to pipeline segmentations that accurately reflect the variation in internal and external corrosion susceptibility.

This diagnosis is followed by the estimation of historical corrosion growth rates (CGRs), achieved using ROSEN's AutoSCAN (Automated Signal Correlation And Normalization). Using pattern recognition algorithms, AutoSCAN precisely matches and normalizes metal loss indications between two ROSEN axial field magnetic flux leakage (MFLA) inspections. Historical depth changes are then estimated using the change in signal amplitude, leading to a significant step change in the accuracy of historical CGRs. By obtaining a complete and accurate distribution of CGRs, optimal CGRs can be selected for integrity management planning, limiting unnecessary repairs while maintaining safety and compliance.

The final step is a review of engineering practices to ensure effective corrosion management. ROSEN collaborates with operators to define and implement a corrosion management strategy, consisting of mitigation and risk-based inspection and monitoring plans.

With CGA^{pro}, operators gain insights into the location, severity, causes of and solutions for active corrosion threats. ■



FIG. 2. The Cleaning Analytic Service allows the collection of valuable pipeline data during cleaning runs.

SHUJI MORI NAMED CEO OF YOKOGAWA CORPORATION OF AMERICA



Yokogawa Corporation of America has appointed Shuji Mori, a company veteran who has been with Yokogawa for nearly three decades, as CEO of Yokogawa Corporation of America. In this new role, Mr. Mori will be responsible for all day-to-day business operations in North America.

Mr. Mori began his career as an engineer, helping implement systems projects for Yokogawa customers around the world. Over the years, he has held a variety of roles throughout the company, most notably in global major account sales, and has acquired extensive experience in the global industrial automation market. ■

EIA: Growing global LNG trade could support Asia market hub

As the world's largest consumer of LNG, Asia accounts for three-quarters of global LNG trade and one-third of total global natural gas trade. However, the region lacks a pricing benchmark that can reliably reflect supply and demand changes in Asia's natural gas markets.

Natural gas market hubs, such as Louisiana's Henry Hub or the UK's National Balancing Point (NBP), have been a key feature of competitive gas markets in the US and Europe. These hubs provide locations—either physical, in the case of Henry Hub, or virtual, in the case of NBP—for trading natural gas and, ultimately, for determining price. The most important hubs have publicly reported price indexes that are benchmarks for the value of natural gas in the larger regional market.

While no location in Asia has sufficiently developed the physical infrastructure or regulatory frameworks to accommodate the creation of a natural gas trading hub, the governments of Japan, China and Singapore are each exploring the possibility of establishing an LNG market hub. Given the emergence of the US as a major LNG supplier, and the potential impact on the structure of future LNG trade in Asia, the US Energy Information

Administration (EIA) commissioned a contractor study—ICF International Inc.'s "Perspectives on the development of LNG market hubs in the Asia-Pacific region"—that examines efforts to establish regional LNG trading hubs and price benchmarks in Asia, and the inherent challenges associated with these efforts.

Strategies to overcome the challenges. Fully established natural gas market hubs, such as the US' Henry Hub, have high liquidity, with a high volume of trades; open access to transport facilities; and transparent price and volume reporting, index pricing and futures contracting. Comparatively, hubs like those in France and Italy have lower trading volumes and less liquidity in forward pricing.

While natural gas hubs in North America and Europe are pipeline-based (e.g., Henry Hub is located in Louisiana, close to natural gas infrastructure on the US Gulf Coast), major countries in Asia rely on LNG as the primary source of natural gas.

LNG-based hubs present a number of challenges compared to pipeline-based hubs. Pipeline hubs rely on continuous flows of natural gas, daily scheduling of receipts and deliveries, standardized natural gas specifications, uniform

transportation and contracting rules, and diligent regulatory oversight. In contrast, LNG shipments can be large and difficult to store; significant time between contracting and delivery is possible; and cargoes can differ in LNG specifications. Asian LNG import terminals have limited pipeline interconnectivity, and operate primarily under long-term bilateral contracts between multiple suppliers and buyers. This limits transparency, third-party access and publicly available price benchmarks.

In 2016, the Japanese government developed a comprehensive strategy to liberalize its domestic natural gas market, and launched major initiatives to encourage private-sector participation in the development of an LNG trading hub and a pricing index. Japan, China

and Singapore have also established benchmark LNG pricing indexes.

For the next few years, LNG indexes will likely remain the most reliable indicators of natural gas market value in Asia. Existing LNG price surveys will continue to improve in accuracy and increase their significance as indicators of the market price for LNG. As solid hub-based price indexes emerge, indexes will be more reliably used to not only set the pricing for sales and purchase contracts, but also to serve as the basis for greater volumes of futures and derivatives trading.

More information on the development of LNG market hubs in Asia can be found in the full report at <https://www.eia.gov/analysis/studies/lng/asia/pdf/lngasia.pdf>. ■

TECHNIP OCEANIA PPU WIN FOR ENERMECH IN AUSTRALIA

EnerMech has been awarded a pre-commissioning subcontract by Technip Oceania Pty Ltd., part of TechnipFMC in Australia, on the Shell Australia-operated *Prelude FLNG* project.

The work scope includes the pre-installation filling of the risers, riser leak testing, pressure monitoring of the umbilical and electrical steel flying lead during pipelay, and electrical flying leads and umbilical testing.

Works will be conducted in field, located approximately 230 km from mainland Northwest Australia, with engineering and project management conducted from EnerMech's Perth, Australia facility. ■

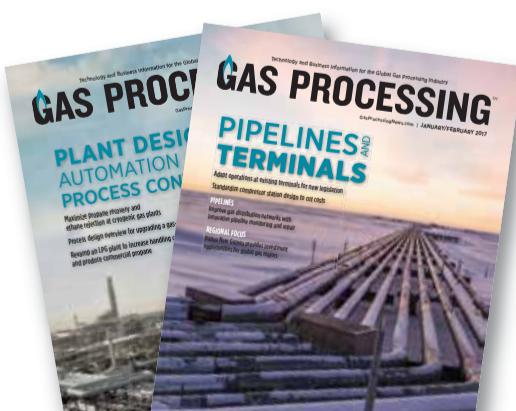
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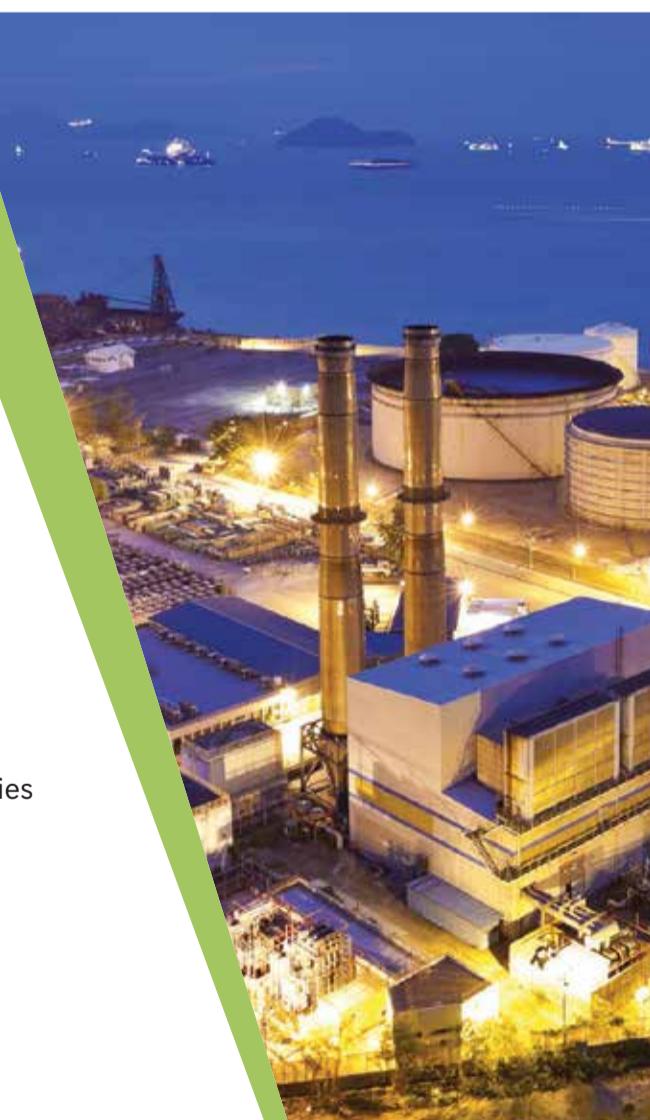
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Scenes from Gastech



- 1 ExxonMobil's networking suite provided attendees with refreshments and a place to connect and discuss industry trends.
- 2 A full house of Gastech attendees kicked off the 2017 event with the opening welcome speeches and presentations.
- 3 Key members of the Gastech Consortium joined together at a ribbon-cutting ceremony at Tuesday morning's opening plenary session.
- 4 The team from ADNOC highlighted its products as industry experts weighed in on the latest trends.
- 5 Batter up! Shell's LNG World Series drew attendees to hear about the company's products and to take a swing at a virtual baseball game.
- 6 As the first day of Gastech began, colleagues gathered at the ConocoPhillips booth to renew relationships and discuss business.
- 7 JERA welcomed guests with traditional Japanese dress and calligraphy artists.



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