
SIGTTO

Society of International Gas Tanker
and Terminal Operators Ltd

Continually promoting best practice
in the liquefied gas shipping and
terminal industries for 40 years



SIGTTO Purpose

SIGTTO has been organised to encourage the safe and responsible operation of liquefied gas tankers and marine terminals handling liquefied gas; to develop advice and guidance for best industrial practice among its members; and to promote criteria for best practice to all who have responsibilities for, or interest in, the safety of gas tankers and terminals.



SIGTTO Vision

SIGTTO will continue to be recognised as the gas shipping and terminal industry body - a modern centre of industry expertise - with all appropriate resources available to address industry technical and operational issues. It will be the industry advocate for the proactive enhancement of safe and sustainable international gas terminal and shipping operations through the provision of consistent guidelines and measures.

SIGTTO

Annual Report 2018

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Making shipboard preparations to ensure compatibility with terminal arrangements for an upcoming cargo transfer operation



Society's sound structure and professionalism smooth President's role

I am pleased to present SIGTTO's 2018 annual report, the last of a trio compiled during my three-year tenure as the Society's President

The selection of 42 New Broad Street as the site of SIGTTO's new London liaison office, which the Secretariat moved into in July 2018, has proven to be well founded. The smart and well-equipped working environment has been welcomed by both staff and visitors and the impressive meeting facilities have been well utilised, saving cost and increasing efficiency.

Meetings of the working groups of the Society's General Purposes and Human Element Committees (GPC and HEC) are now held at the venue and it is planned to hold one of the Board of Directors meetings there in 2020. Some SIGTTO members have also found the facilities useful for their own meetings, evidence that the availability can be a valuable benefit of membership.

The Society's 64th Panel Meeting was held in London in April, hosted by Smit Lamnalco. Featuring a technical visit to HR Wallingford, the event was marked by excellent participation and positive feedback about content and organisation.

The spring 2018 Board meeting was held in the Isle of Man, hosted by Bernhard Schulte Shipmanagement. The autumn Board and Annual General Meetings were held in Doha, hosted by Nakilat. Both events were completed successfully with a high proportion of Directors present. SIGTTO's Board has been an important contributor to the Society's success and the governance and advice provided by the Directors over many years has helped mould an organisation that remains focused on delivering effective safety guidance to the industry and value for money to its members.

The 2018 Gastech event was held in Barcelona and SIGTTO hosted a joint exhibition stand with the Society's publishers, Witherbys. The inclusion of a meeting room on the stand that could be booked for networking proved very popular with members. One of the most notable aspects of the event was the

receipt by Chris Clucas, my colleague and former SIGTTO GPC chair, of Gastech's lifetime achievement award. Chris has devoted most of his professional career to gas shipping and is one of the industry's foremost experts. Such recognition by his peers was a worthy reward for Chris who is acknowledged to be a consummate teacher and one always willing to share his knowledge.

Maintaining engagement with SIGTTO's diverse and wide-ranging membership is important and 10 Regional Forums were staged during 2018 to extend the dialogue out-reach. The gatherings took place in Oslo, Singapore, Athens, Buenos Aires, Tokyo, Perth, Shanghai, Dubai and twice in Houston. Regional Forums provide an excellent opportunity for the Secretariat to meet many of the Society's members and get direct feedback on important issues, including regional developments that could have relevance internationally. Such engagement at a more local level helps illuminate risk exposure within the industry, which in turn assists in defining mitigating actions that will be captured in future revisions of the Society's overall Strategic Plan.

SIGTTO has remained remarkably productive over the years, with several working groups active at any one time and a newly established sub-committee under its umbrella. The new body, known as the Floating LNG Installations Sub-committee, has responsibility for what is currently one of the most challenging and innovative sectors of the gas shipping and terminal industry. The Floating LNG Installations Sub-committee has three working groups, covering the topics of site assessment, design criteria and operational guidance for nearshore/offshore LNG assets.

The currently active GPC working groups are prioritising the development of updated guidance on propulsion and reliquefaction systems, gangways, pressure relief valves and emergency shutdown systems. The documents emanating from these groups

will be submitted to the SIGTTO Board for approval during 2019 and 2020.

Working groups currently active under the auspices of SIGTTO's HEC have three priority areas in focus. They are cargo control room ergonomics, gap analysis of competency guidelines and shore staff competencies. HEC's first document, *Recommendations for Management of Cargo Alarm Systems*, has recently been issued as a free publication.

SIGTTO celebrates its 40th anniversary in 2019 and, with the growth in LNG production and seaborne transportation set to accelerate, the Society's role in promoting safe and reliable operations has never been more relevant or needed. I am confident that with the combination of modern facilities and resources, the Secretariat and membership expertise and a well-structured strategic framework of what needs to be achieved, the Society is well placed to remain at the forefront of liquefied gas shipping safety. If we can continue to expand membership and generate enthusiastic participation in the various committees and working groups, SIGTTO's core purpose will be achieved.

On a personal note I will be stepping down as President in November 2019 and handing the reins over to the current Vice-President, Steffen Jacobsen, who I know will do an excellent job. It has been an absolute privilege serving as the Society's President and one of the highlights of my shipping career. I would like to thank my fellow Directors for their trust and support and also recognise the fact that the professionalism and competence of Andrew Clifton and his team have made my tenure very straightforward.

David Furnival
SIGTTO President
August 2019

Starting life as Ben Badis in 2010, the 177,000 m³, MOL-operated Spirit of Hela loaded Papua New Guinea's first LNG export cargo in May 2014





Establishing a sound base for SIGTTO's future

The move to spacious and customised new premises represented a key milestone for the Society in 2018

During 2018 five new members joined SIGTTO and seven resigned. As of 31 December 2018 we had a total of 136 full members and 45 associates for a total membership of 181. The Society has members in 50 countries worldwide.

The SIGTTO Board of Directors met three times during 2018, as per the Society's byelaws. The spring Board meeting, kindly hosted by Bernhard Schulte Shipmanagement, was held in the Isle of Man while the autumn Board and Annual General Meetings took place in Doha, Qatar where Nakilat was the host.

The Society is registered in Bermuda as a "not-for-profit" entity. However, we are allowed to retain surplus as reserves and each year we set the budget to generate a small surplus which goes to reserves. The reserve level we target is about one year's operating costs and we are comfortably in excess of this target. The Society's finances remain on a sound footing.

SIGTTO's General Purposes Committee (GPC) and Human Element Committee (HEC) manage the Society's affairs. GPC met twice in 2018, in London in April and Barcelona in September in conjunction with the Gastech event, while HEC also convened twice during the year, with both meetings being held in London. The Society maintains a full programme of activities, most of which are addressed by working groups established by the two committees and populated by experts selected from the member companies.

HEC is a relatively new SIGTTO body, having held its first meeting in September 2016. In 2018 the committee produced its first publication. Entitled *Recommendations for Management of Cargo Alarm Systems*, it recommends the implementation of alarm management philosophies for gas carrier cargo alarm systems by encouraging shipowners to work with system designers, classification societies and shipyards to create a cargo alarm management system on each ship. The information in this publication is based on existing philosophies in the

International Safety Management (ISM) Code, the Code on Alerts and Indicators, the International Gas Carrier (IGC) Code and the IEC 62682 standard. Alarm management is a good example of how human element considerations can lead to improved safety performance.

Hosted by Smit Lamnalco, SIGTTO's 64th Panel Meeting was held in London in April, in the days following the GPC's spring 2018 gathering in the same city. There was no autumn 2018 Panel Meeting due to the clash with Gastech 2018 event in Barcelona. SIGTTO Panels represent the main meeting forum for the members, and the spring 2018 Panel, like all the other events in the series, was well attended.

SIGTTO's Regional Forum meetings continue to be held on a regular basis in various locations around the world. The timing of such meetings is largely dictated by the members themselves.

A key focus for the Secretariat in 2018 was the office move from St Helens Place, where we had resided for 25 years, to the new premises a short distance away, also in the traditional shipping area of the City of London. Our new location is much more suited to our developing needs, as it allows for staff expansion and offers better resources, including a large meeting room.

The newly laid out and decorated office has exceeded all expectations and I am confident these premises will serve the Society well for many years to come. We have welcomed many of you at the new location since we moved in July 2018, including those attending SIGTTO meetings in our conference room and visitors simply passing through on trips to London. We look forward to seeing more of the membership whenever it is possible for you to stop by.

The Secretariat maintains a programme of external engagements to promote the Society's profile. These include speaking to various bodies and chairing and presenting papers at conferences such as Gastech and the LNG series of

conferences. SIGTTO maintained its usual high profile at Gastech 2018 in September in Barcelona, where I once again chaired the conference's shipping session.

I similarly was in the chair for the shipping session at LNG 2019 in April in Shanghai, an event which tied in with SIGTTO's 79th GPC meeting. The 80th GPC gathering will also coincide with a major industry conference, in this case Gastech 2019 in September in Houston, where I will once again lead the shipping session discussions. Because of LNG 2019 and Gastech 2019, there are no SIGTTO Panel Meetings scheduled in 2019. My involvement with Gastech has recently been extended as I am now also co-chair of the event's technical committee.

In addition to the normal two GPC, two board of director and two HEC meetings scheduled for 2019, SIGTTO also plans to stage 12 Regional Forums during the year.

The Society has also been pleased to announce a number of new Secretariat appointments recently. Erin Rydings, joined us as receptionist in mid-2018 and more recently we've welcomed Laura Else as technical support executive and Uluc Kaypak as technical adviser on secondment from Shell.

On 10 September 2019 SIGTTO will be holding a liquefied gas shipping forum followed by the 40th anniversary reception in London to celebrate four decades of Society accomplishments.

The Society continues to be the principal voice for the liquefied gas industry. As SIGTTO General Manager, I look forward immensely to 2019, meeting and working with the membership. Our industry is in the midst of a particularly dynamic phase, making it a very exciting and challenging time to be in this role.

Andrew Clifton
General Manager August 2019

SIGTTO members (as at 31 December 2018)

Full Members

| | | |
|---|---|--|
| Aegis Logistics Ltd | Excelerate Energy LP | NYK Line (Nippon Yusen Kaisha) |
| AES Andres | Exmar NV | Oiltanking Antwerp Gas Terminal NV |
| Alphagas SA | ExxonMobil - SeaRiver Maritime | OLT Offshore LNG Toscana SpA |
| Angola LNG Ltd | Fluxys LNG | Oman LNG LLC |
| Angola LNG Marketing | Freeport LNG Development LP | Osaka Gas Co Ltd |
| Anthony Veder Rederijzaken BV | GasLog LNG Services Ltd | Pertamina Transportation LNG - JMG |
| Atlantic LNG Company of Trinidad & Tobago | Gate Terminal BV | Petrobras Transporte SA - Transpetro |
| Avance Gas Holding Ltd | Gazocean | Petronet LNG Ltd |
| Bahia de Bizkaia Gas SL | Geogas Maritime SAS | POSCO |
| Bernhard Schulte Shipmanagement Ltd | GNL Quintero SA | Prime Gas Management Inc |
| B-Gas Ltd | Golar Management Norway AS | Pronav Ship Management |
| BP Berau Ltd | Golden Pass LNG | PT Donggi Senoro LNG |
| BP Shipping Ltd | Höegh LNG | PTT LNG Company Ltd |
| Brunei LNG Sdn Bhd | Hyproc Shipping Company | Qatar Gas Transport Company Ltd |
| Bumi Armada Berhad | Hyundai LNG Shipping Co Ltd | Qatar Petroleum (Industrial Cities Ports) |
| BW Gas AS | Iino Kaiun Kaisha Ltd | Qatargas Operating Company Ltd |
| BW LPG Ltd | Ineos | QCLNG Operation Company Pty Ltd |
| Calor Gas Ltd | Inpex Corporation | RWE Supply & Trading GmbH |
| Cameron LNG | International Gas Transportation Co Ltd | Santos GLNG |
| Canaport LNG | Iwatani Corporation | Saudi Arabian Oil Co (Saudi Aramco) |
| Centrica LNG Company Ltd | Japan Petroleum Exploration Co Ltd | SCF Management Services (Dubai) Ltd |
| Chemgas Shipping BV | Jero Co Inc | Sempra LNG |
| Cheniere LNG Inc | JXTG Nippon Oil & Energy Corporation | Shell International Trading & Shipping Co Ltd |
| Chevron Shipping Company LLC | Kansai Electric Power Co Inc | Shipping Corporation of India |
| China LNG Shipping (International) Company Ltd | Kawasaki Kisen Kaisha Ltd | Shizuoka Gas Co Ltd |
| Chugoku Electric Power Co Inc | Kinder Morgan Inc | Singapore LNG Corporation Pte Ltd |
| ConocoPhillips Global Marine | Knutsen OAS Shipping | SK Shipping |
| CPC Corporation, Taiwan | Koch Shipping Pte Ltd | Sonangol Marine Services Inc |
| DESFA Hellenic Gas Transmission System Operation | Korea Gas Corporation | South Hook LNG Terminal Co Ltd |
| Dorian LPG Management Corp | Kuwait Oil Tanker Co SAK | Stena LNG Services AB |
| Dragon LNG Ltd | Latsco Marine Management Inc | Synergy Maritime Pvt Ltd |
| Dubai Supply Authority | Lauritzen Kosan A/S | Teekay Marine Solutions (Bermuda) Ltd |
| Dunkerque LNG | LNG Japan Corporation | Teekay Shipping |
| Dynagas Ltd | LNG Shipping SpA | The Bahrain Petroleum Company BSC (Closed) |
| Egegaz Anonim Sirketi | Malaysia LNG Sdn Bhd | Thenamaris LNG |
| Egyptian Operating Company for Natural Gas Liquefaction Projects | Maran Gas Maritime Inc | TMS Cardiff Gas Ltd |
| Elengy | Marubeni Corporation | Toho Gas Co Ltd |
| Empresa Naviera Elcano SA | Meiji Shipping Co Ltd | Tohoku Electric Power Co Inc |
| Enagas Transporte SAU | MISC Bhd | Tokyo Gas Co Ltd |
| Energy Transfer Partners | Mitsubishi Corporation | Total SA |
| Enterprise Product Partners LP | Mitsui & Co Plant Systems Ltd | Uniper Global Commodities SE |
| Etki Liman Isletmeleri Dogalgaz Ithalat Ve Ticaret AS | Mitsui OSK Lines Ltd | V Ships Ltd |
| Evergas A/S | Naftomar Shipping & Trading Co | Wilhelmsen Ship Management Sdn Bhd |
| | National Gas Shipping Company Ltd | Woodside Energy Ltd |
| | National Grid Grain LNG | YPF SA |
| | Nigeria LNG Ltd | |
| | Norgas Carriers Private Ltd | |
| | Northern Marine Management Ltd | |

Associate Members

| | | |
|-------------------------------------|------------------------------|---------------------------------|
| ABS | GTT Training Ltd | Polskie LNG SA |
| Anadarko Petroleum Corporation | Guangdong Dapeng LNG Co Ltd | Port of Rotterdam Authority |
| Babcock International Group | Hazira Port Private Ltd | Rimorchiatori Riuniti Spezzini |
| Boluda Towage and Salvage | Jordan Cove LNG LLC | – Imprese Maritime |
| Bureau Veritas Marine & Offshore | Korean Register | Saga LNG Shipping Pte Ltd |
| China Energy Ship Management Co Ltd | Kotug International | Single Buoy Moorings Inc |
| ClassNK | Kuwait Integrated Petroleum | Smit Lamnalco |
| CNOOC-Fujian LNG Co Ltd | Industries Co | Steelhead LNG Corp |
| Combined Marine Terminal | Lloyd's Register | Svitzer A/S |
| Operations Worldwide NV | LNG Canada Development Inc | Toshiba America LNG Corporation |
| DNV GL | Maritime and Port Authority | Venture Global LNG Inc |
| ElectroGas Malta Ltd | of Singapore | Vitol Services Ltd |
| ExxonMobil PNG Ltd | Maritime Safety Queensland | Warsash Maritime Academy |
| FLEX LNG | Milford Haven Port Authority | (Southampton Solent University) |
| Fratelli Neri SpA | Moran Towing Corporation | Western Concessions Pvt Ltd |
| Gazprom Marketing & Trading | NextDecade LLC | Woodfibre LNG Ltd |
| Singapore Pte Ltd | Polish Oil and Gas Company | |

BENEFITS OF SIGTTO MEMBERSHIP

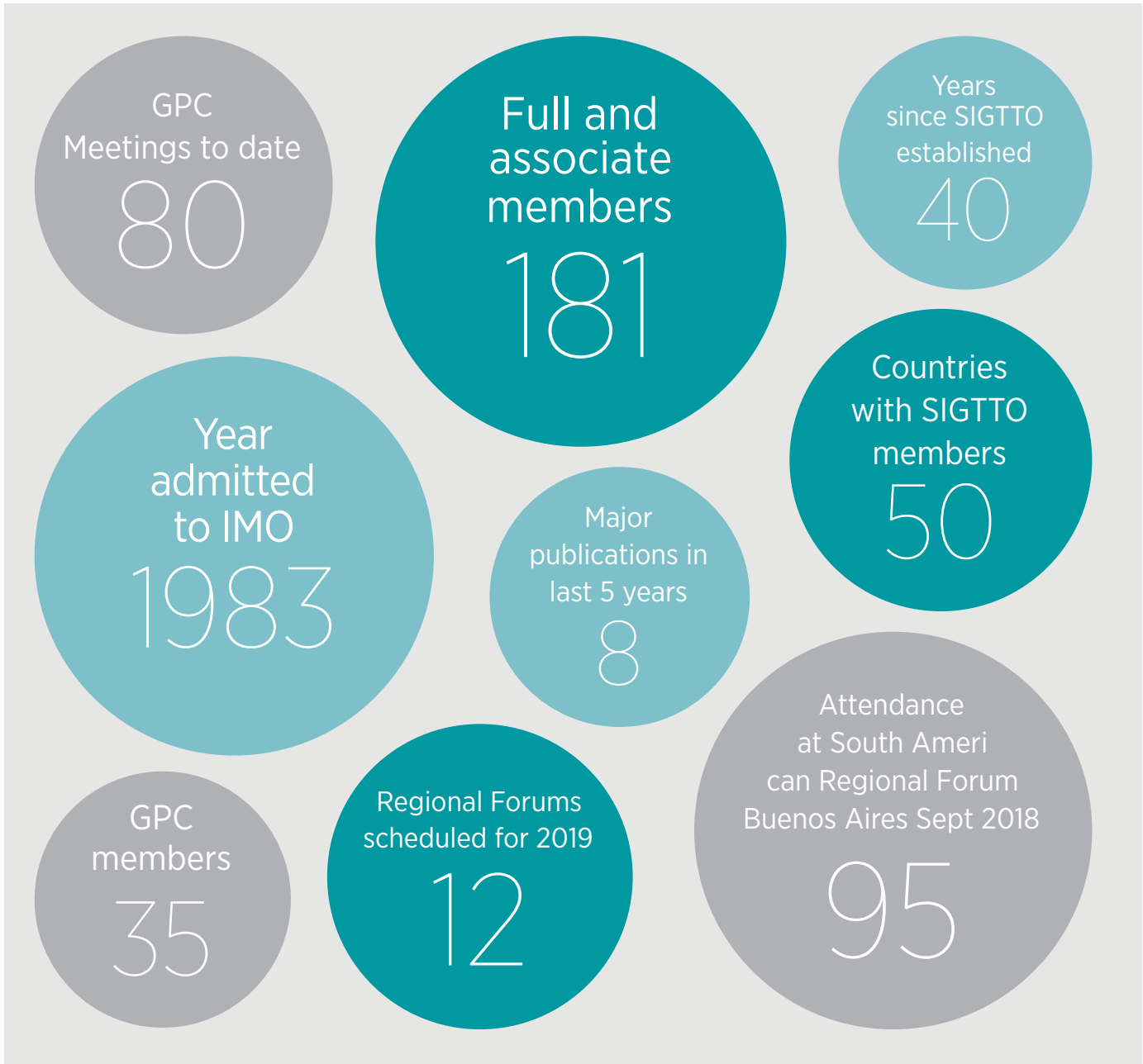
SIGTTO members are actively encouraged to promote membership when dealing with any new players in the industry. Please direct them to our website and to the London Liaison Office for further details of how to join.

In addition to the credibility in the industry that membership brings, SIGTTO members benefit by:

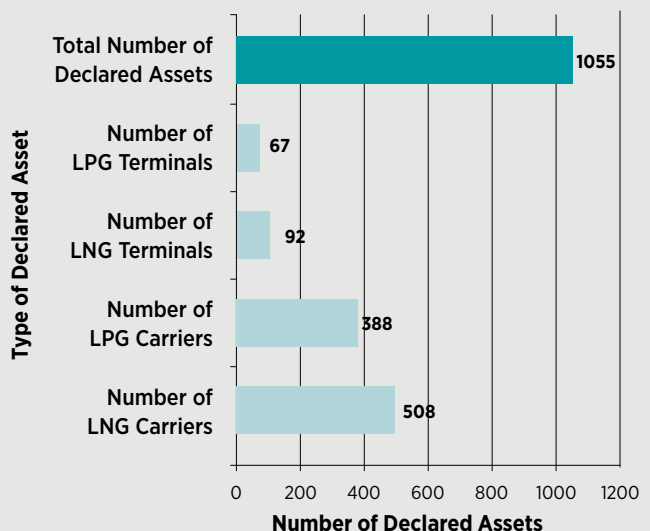
- Access to information that is exclusive to members, such as casualty information and industry statistics
- Regular updates on matters affecting the industry such as legislation, either new or pending, technical or operational developments
- Access to the very comprehensive technical library maintained in the London Office
- Submitting proposals for projects and studies to the General Purposes Committee
- Access to the Technical Advisers in the London Liaison Office who can give advice and obtain advice, on behalf of a member, from within the Society
- Participating in discussion forums with other members each year on topics of particular and mutual interest
- New members receive a copy of all publications, free of charge, produced by SIGTTO
- Free access to the LNGwebinfo portal for updated LNG information as required to conduct compatibility studies. This information is restricted to members of SIGTTO and GIIGNL only



Malaysia, one of the world's largest LNG exporters, began importing cargoes in 2013; first, here at Malacca, and, more recently, at Pengerang



SIGTTO Members' Declared Assets



SIGTTO Board of Directors (as of 31 December 2018)



The Isle of Man was the venue for spring 2018 meeting of the SIGTTO Board of Directors

| | | | |
|-----------------------------------|----------------------------------|-------------------------------|------------------------------------|
| Mr David Furnival | Bernard Schulte SM [President] | Mr Raja Sager Muniandy | MISC |
| Mr Masayuki Ishida | Jera [Vice President East] | Mr Abdullah Al-Sulaiti | Qatar Gas Transport |
| Mr Steffen Jacobsen | Evergas [Vice President West] | Mr Hisaichi Yoneyama | Osaka Gas |
| Mr Mark Fortnum | BP Shipping | Mr Takashi Hashimoto | Mitsui OSK Lines |
| Mr Luc Gillet | Total SA | Mr Riju Cherian | BW Gas |
| Mr Stephan Tschudi-Madsen | Høegh LNG | Mr Iain Relf | Teekay Shipping |
| Mr George Paul Perantzakis | Naftomar | Mr Emilio Tsocialis | SeaRiver Maritime/ExxonMobil |
| Mr Akira Kono | NYK Line | Ms Katherine Trauth | Shell |
| Mr Lloyd Bland | Chevron Shipping | Mr Peter Pearman | Conyers Dill & Pearman |
| Mr Paul Oliver | International Gas Transportation | Mr Edwin Mortimer | Conyers Dill & Pearman [Secretary] |



When the Board of Directors gathered in the Qatari capital of Doha for their autumn 2018 meeting, they had to acclimatise to somewhat higher temperatures than those encountered on the Isle of Man

SIGTTO Secretariat Staff



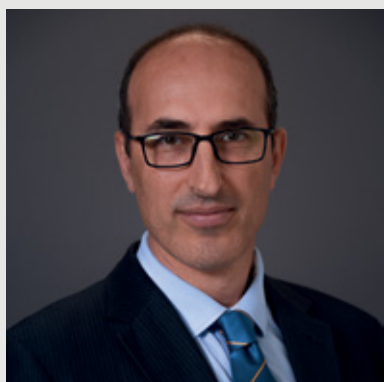
Andrew Clifton
General Manager



Cherian Oommen
Technical Adviser



Rob Farmer
Technical Adviser



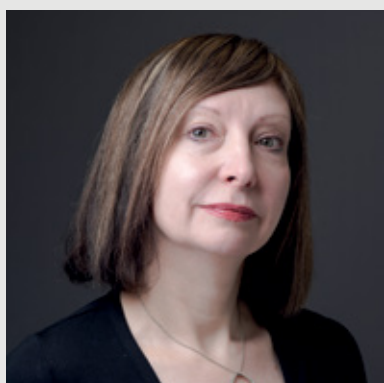
Uluc Kaypak
Technical Adviser



Ian Harrison
IMO Representative



Dave Ervin
Consultant Technical Adviser



Susan Humphrey
Membership Manager



Laura Else
Technical Support Executive



Erin Rydings
Receptionist

SIGTTO committees expand work scope



The new Floating LNG Installations Subcommittee's first project involves three working groups jointly drafting a master set of guidelines

In recent years SIGTTO's General Purposes Committee (GPC), the technical body that has traditionally originated and coordinated all the internal projects generated by the Society, has been joined by the newly established Human Element Committee (HEC).

The decision by SIGTTO's Board of Directors to form the Human Element Committee recognises the critical importance of the human factor and training in gas carrier and terminal operations as part of the ongoing effort to sustain a safety performance which to date is unmatched by any other maritime sector. The HEC's remit includes, but is not limited to, competency and training, design and ergonomics and the human element side of incident investigation.

Completion of new project work identified by GPC and HEC is carried out by working groups comprising relevant experts from amongst the membership. The technical publications which are the end-result of

these projects are effectively the best practice procedures, recommendations and standards that guide the industry's day-to-day operations.

GPC and HEC both meet twice a year and report to the SIGTTO Board. Smooth interfacing arrangements between the committees are an integral part of their *modus operandi*. For example, the HEC chair is also a GPC member and vice versa with the GPC chair.

At the time that HEC was formed in 2016, the SIGTTO directors also recognised that there was also a need to create a range of subcommittees to support and augment GPC and HEC. Such subsidiary bodies would recognise the increasingly diverse nature of the liquefied gas shipping and terminal sector and the extension of the liquefied gas supply chain into new areas currently taking place. The first of the new SIGTTO subcommittees, on floating LNG installations, has now been established. It is a GPC subsidiary body.

Floating LNG installations

Tasked with considering the many aspects of the rapidly expanding fleet of floating LNG regasification, storage and production vessels, the SIGTTO Subcommittee for Floating LNG Installations held its inaugural meeting in February 2018 and gathered twice more during the year, in May and December. At these sessions the Subcommittee's terms of reference (ToR) were completed and approved, and Ed Scott of Exceleerate Energy was appointed to chair the Subcommittee.

The Floating LNG Installations Subcommittee identified three specific areas where participants in the floating LNG sector would derive benefit from the speedy availability of industry best practice guidelines, and three working groups were formed to develop the required documentation.

Working Groups 1, 2 and 3 for Floating LNG Installations are dealing with

topics relating to the site assessment, design criteria and operational guidance, respectively, as they relate to nearshore/offshore floating LNG assets. All three had kick-off meetings in March and July 2018 when ToRs were completed and approved and workload assignments were launched. Chair persons of Working Groups 1, 2 and 3 are, respectively, Andrew Brown of Smit Lamnalco, Stuart Thomson of BP and Excelerate Energy's Jeff Meadows.

The working groups are working on a draft master document and the intention is to have the final document ready for review at the 81st GPC meeting (GPC 81) in spring 2020.

General Purposes Committee (GPC)

The topics that GPC currently has in focus are propulsion systems, reliquefaction systems, gangways, pressure relief valves and emergency shutdown systems. Working groups, comprising relevant industry experts from amongst the membership, have been established to examine each issue.

The Propulsion System and Reliquefaction System Working Groups are both chaired by Kenny English of BP Shipping. The working group members have launched their collaboration to produce documents that will effectively upgrade existing industry best practice guidelines to consider recent technology advances. The intention is to submit a draft guidance document at the autumn 2019 GPC meeting, i.e. GPC 80, for approval.

The Gangways Working Group is chaired by Rick Boudiette of Chevron Shipping. Draft guidance for designers, terminals, vessel owners and operators on safe landing areas and gangway operations has been prepared and, once again, the intention is to secure approval for the prepared document at GPC 80.

Another industry best practice text earmarked for tabling at GPC 80 for approval is a draft pressure relief valve (PRV) guidance document. The text updates gas carrier cargo system PRV design and maintenance guidance previously issued by SIGTTO in 1998.

At GPC 78 in September 2018 the terms of reference for the Emergency



The Emergency Shutdown Systems (ESD) Working Group is focused on the revision of SIGTTO's previous guidance on the topic, issued in 2009

Shutdown Systems (ESD) Working Group were approved. The core purpose of the group is to revise SIGTTO's publication *ESD Arrangements and Linked Ship/Shore Systems for Liquefied Gas Carriers – 2009*.

The revision is considering technical improvements that have been made and lessons learnt from incidents since the earlier document was published. The group, which is chaired by Ajay Edakkara of Shell, is also reviewing the issue of testing cargo tank overflow systems, as raised at IMO, and seeking to ensure that all ESD references are aligned across SIGTTO publications.

Human Element Committee

HEC currently has three active working groups underway, on cargo control room ergonomics, the Gap analysis of competency guidelines and shore staff competencies.

Under the chairmanship of Ray Gillet of GTT Training, the Cargo Control Room (CCR) Ergonomics Working Group completed its work on *Recommendations for Management of Cargo Alarm Systems* at its seventh meeting in October 2018. The document was approved by the Human Element Committee at its 6th meeting (HEC 06) in January 2019 and received final approval from the SIGTTO Board in May 2019. The guidelines constitute the first document to be published under the auspices of HEC.

The CCR Working Group also considered its next steps at the October 2018 meeting and agreed to focus on cargo control room layout and ergonomics, considering aspects such as control station layout, physical environment, operator interface, controls, displays and the human/machine interface (HMI). The aim is to develop guidance for operators on how to improve the safety of cargo operations through detailed consideration of operational practice within the specification and design of CCR workstations and HMI.

HEC 06 approved the expansion of the initial Task Force for the Gap Analysis of SIGTTO Competency Guidelines into a full-term working group and its terms of reference (ToR). The Gap Analysis Competency Working Group is focused on the establishment of methodology for a major revision of SIGTTO's four crew competency publications. The introduction of new technologies in the LNG industry has resulted in a need to revise relevant parts of the Society's competency guidelines. Steve Allibone of MOL LNG Transport is chairing this group.

The Working Group for Shore Staff Competencies is continuing to scope the applicability of topics within the agreed terms of reference. Topics under review include shore staff competencies for owners/operators of gas carriers and their interfaces with vessels and terminals. Dr Linda Sørensen of BW Gas is chairing this group.

SIGTTO meetings reinforce membership outreach



Coralius, one of the new breed of LNG bunker vessels that have taken to the sea in recent years, fuels a gas-powered Baltic Sea product tanker

SIGTTO's busy schedule of Panel Meetings and Regional Forums enables the Society to maintain a regular and ongoing dialogue with its full membership. On the one hand, the events provide opportunities for the Secretariat and members participating in current project working groups to highlight the key issues concerning the industry to the wider membership. And, on the other, the get-togethers enable each Society member to contribute to the discussions and raise new matters for SIGTTO's General Purposes Committee (GPC) and Human Element Committee (HEC) to consider for future projects involving the development of industry best practice guidelines.

Panel Meetings are held once or twice a year, typically in conjunction with a spring General Purposes Committee (GPC) meeting in April and/or an autumn GPC meeting in September/October. Panel Meetings attract large attendances and are open to every member of the Society as well as a limited number of guests such as potential members or subject matter experts. Generally taking place over two days, Panel Meetings provide opportunities for a frank and free exchange of views and opinions on matters of current interest to the industry, plus a series of presentations on topical subjects.

The latter can include talks on lessons learnt, which are shared under Chatham House Rules. SIGTTO Panel Meetings can be held anywhere in the world, the location depending on the that of the Society member hosting the event.

SIGTTO Regional Forums are held regularly to address local issues and to provide those members without the resources to travel to distant Panel Meetings with an opportunity to participate directly in the Society's proceedings. There are typically around 12 Regional Forums per year, each lasting a day. Forum agendas are proposed by the local members themselves while the SIGTTO Secretariat acts as secretary to the meetings. The events are open to members along with selected invited guests such as potential members or subject matter experts.

SIGTTO Regional Forums currently take place on a regular basis worldwide under the following event headings:

- Pan American
- South American
- Western European
- Scandinavian
- Mediterranean
- Australian
- Middle Eastern
- Asia Pacific
- Indian

London Panel

There was one SIGTTO Panel Meeting in 2018, the 64th event in the series, which was held in London in April. The gathering was hosted by Smit Lamnalco and was augmented by a technical visit to HR Wallingford in Oxfordshire. A number of topical issues were the focus of attention in the Panel presentations, including vessel mooring systems, the bowtie risk assessment methodology, focus points for SIGTTO's new Floating LNG Installations Subcommittee, the surge phenomenon in LNG and LPG loading systems and LNG bunker vessels (LNGBVs).

LNGBVs are a new type of LNG carrier and at the 64th Panel Hans-Christian Haarmann-Kühn of TGE Marine Gas Engineering was on hand to explain to delegates the special capabilities required of LNGBVs, over and above the attributes of similar-sized small-scale LNG carriers.

For a start, LNGBVs can be called upon to supply LNG fuel to a variety of different bunker tank arrangements on the gas-fuelled vessel. The receiving system could be either a vacuum-insulated pressure build-up tank; semi-pressurised storage with boil-off gas (BOG) compressors; or a fully refrigerated

storage tank, of the membrane type, for example, when large volumes of LNG bunkers are being carried.

Of even greater variety is the range of different gas-powered vessel types and sizes that can require fuelling, each with its own manifold arrangement and a set time window for transfer operations. As LNGBVs will be designed around the needs of the biggest potential customer, questions then arise about the ability of fuelling manifolds on smaller LNG-powered ships to accommodate high-capacity transfer equipment.

In most operating scenarios the LNGBV will be required to provide its services in a timely and efficient manner. In addition, it may be called upon to support special operations such as gassing up, cooling down, inerting and the discharge of residual fuel gas. Also, LNGBVs may have to offer a back-up service as a feeder LNG carrier, on the one hand, and deal with long idle periods from time to time on the other.

In conclusion, the new breed of LNGBVs now entering service are highly specialised small gas carriers. The service that they offer requires new processes and a high degree of flexibility to handle the broad range of operating conditions likely to be encountered.

Ten Regional Forums

A total of 10 SIGTTO Regional Forums were held in 2018. The events were staged in Oslo, Singapore, Athens, Buenos Aires, Tokyo, Perth, Shanghai, Dubai and Houston. In fact Houston played host to two Pan American Regional Forums last year.

The second Asia Pacific Regional Forum of 2018, organised in Shanghai in December, also featured a presentation on LNGBVs. The project in focus was the construction of the world's largest LNGBV, currently underway at the CSSC Hudong Zhonghua yard in China for CMA CGM of France. The 18,600 m³ LNGBV will be utilised to fuel a fleet of nine 22,000 TEU, dual-fuel container ships, also building in China for CMA CGM. All the ships, including the LNGBV, are set for 2020 delivery.

Eiji Kato of Mitsui OSK Line (MOL), the site and project manager at Hudong

Zhonghua, told Shanghai Regional Forum delegates that the new LNGBV will supply the fleet of box ships with an aggregate 300,000 tonnes of LNG annually once the project is underway. MOL will operate the vessel and jointly own it with Total. Rotterdam will be the primary bunkering site although fuelling operations will also be possible in Dunkirk, Zeebrugge and Le Havre.

The LNGBV is being provided with two GTT Mark III Flex membrane cargo tanks of 9,300 m³ each. The aggregate capacity aligns with that of the single, 18,600 m³ GTT Mark III LNG bunker tank on each container ship. The LNG fueller's propulsion system, comprising four dual-fuel, medium-speed diesel generators driving two stern azimuthing thrusters, is designed to provide the vessel with a high degree of manoeuvrability and to obviate the need for tug assistance.

Fourth Senior Executive Forum

There is another new series of meetings that is now a regular feature of the SIGTTO calendar and that is the Liquefied Gas Senior Executive Forum. This event is held every December in Houston in conjunction with the US Coast Guard and the Society for Gas as a Marine Fuel (SGMF). The first Senior Executive Forum took place in 2015 and the December 2018 gathering, the fourth event in series, attracted 250 attendees. The large Senior Executive Forum turnouts reflect the current high level of interest in gas carrier and terminal activities

in the US, due not least to record LPG exports, the start of worldwide LNG and ethane export volumes and the country's introduction of LNG-powered ships and LNG bunkering.

Proceedings at the December 2018 Senior Executive Forum also included a presentation on the LNG bunkering theme. Rudolph Wettstein, general manager marketing & application for Winterthur Gas & Diesel Ltd (WinGD), the engine manufacturer, described the propulsion system that will drive the CMA CGM dual-fuel container ships. Each ship will be provided with a WinGD W12X92DF engine, the most powerful gas-fuelled engine yet constructed.

Each unit will weigh 2,140 tonnes and develop 63.84 MW of power. The engines operate to the lean-burn Otto combustion cycle principle, ensuring that they are in compliance with the IMO Tier III nitrogen oxide emissions requirements at all times when operating in the gas mode.

At the time of Mr Wettstein's presentation 18 ships powered by WinGD's X-DF dual fuel engines had successfully completed sea trials and were in service, comprising eight conventional size LNG carriers, one coastal LNG tanker, four coastal chemical tankers, three coastal asphalt carriers and three Aframax oil tankers. Furthermore, an additional 43 conventional-size X-DF LNGCs were on order in December 2018, as were a further 29 X-DF-powered commercial vessels of other types, including the CMA CGM box ships.



Andrew Brown of Smit Lamnalco, host of the 64th Panel Meeting, addresses delegates on the topic of floating LNG installations

LNG carrier fleet by numbers

Number of icebreaking LNG carriers delivered in 2018

5

Number of vessels in LNG fleet at end-2018

563

Number of LNG carriers scrapped in 2018

5

Number of LNG vessels less than 10 years old

347

Number of ships of less than 25,000 m³ in LNG fleet

33

Capacity of LNG fleet in cubic metres

83.1 million

Number of FSRUs in LNG fleet

33

Number of LNG ships on order at end-2018, of which 46 scheduled for 2019 delivery; 10 of the orderbook total are FSRUs

138

Number of membrane tank vessels in LNG fleet; 128 are Moss ships and 43 have "other" containment systems

392

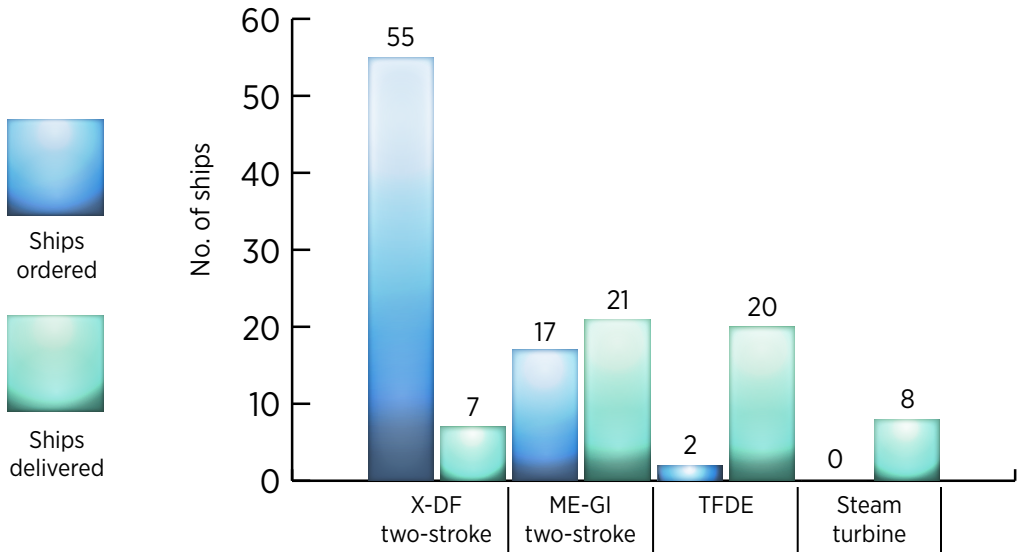
Number of LNG ships ordered in 2018, of which 35 for Greek owners; only 19 new orders were placed in 2017

74

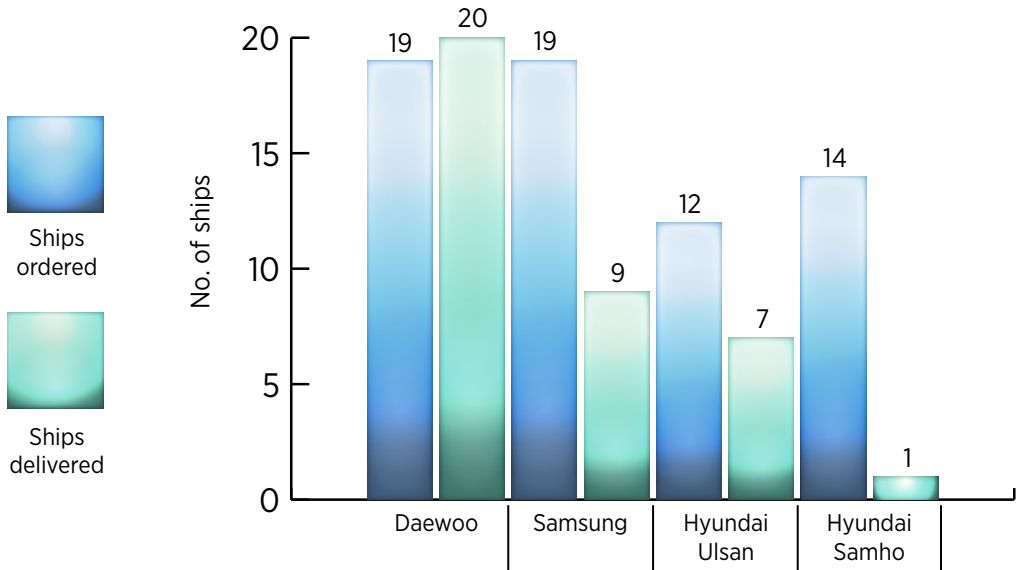
Number of LNG ships delivered in 2018

56

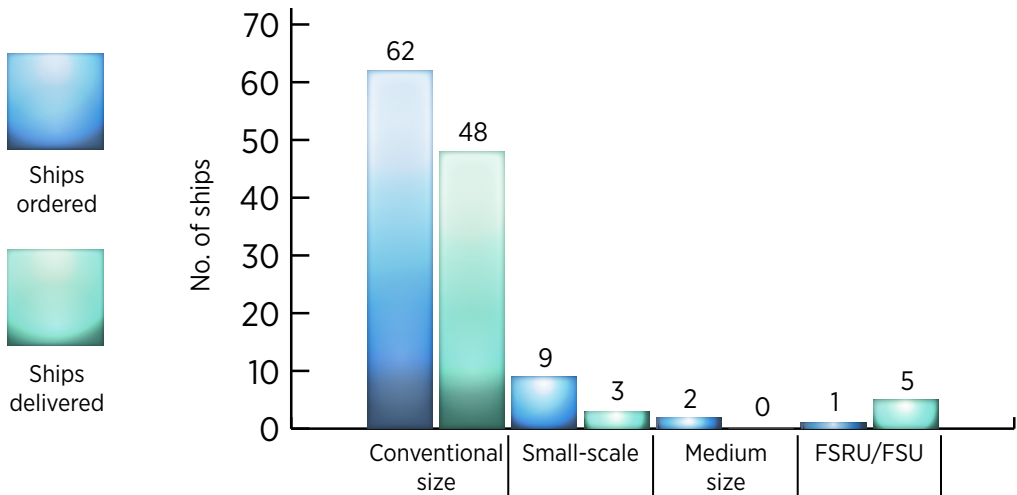
LNG shipbuilding activity in 2018, by propulsion system



LNG shipbuilding activity in 2018, by leading LNGC Korean yards



LNG shipbuilding activity in 2018, by vessel type



Gas shipping and terminal timeline 2018

A roundup of key gas shipping and terminal developments in 2018 highlights many aspects of a dynamic industry. These include the spread of an increasingly diverse global infrastructure; the application of new technologies; the emergence of new players and cargoes; and the introduction of new vessel types.

In 2018 the global trade in LNG passed the 300 million tonnes per annum (mta), three times the volume shipped by sea at the start of the millennium. Worldwide movements of LPG in 2018 approached the 100 mta level and are poised to pass this milestone in 2019.

January

- Exmar chose LPG-burning, dual-fuel engines to propel a pair of very large gas carriers (VLGCs) being built by Hanjin Heavy Industries & Construction at Subic Bay in the Philippines; they will be the world's first LPG-fuelled vessels on delivery in 2020
- Nicaragua and Myanmar imported seaborne LPG shipments for the first time
- Qatar Petroleum merged Qatargas and RasGas, its affiliated gas operating companies, into one entity, Qatargas



Qatar's two LNG carrier charterers – Qatargas and RasGas – have been amalgamated into a single operating entity - Qatargas

February

- Total and MOL ordered an 18,600 m³ LNG bunker vessel, the world's largest such ship, at Hudong-Zhonghua in China for use in fuelling the nine LNG-powered, 22,000 TEU box ships under construction for CMA CGM
- The newly delivered 50,000 dwt dual-fuel bulk carrier *Ilshin Green Iris* featured a 500 m³ IMO Type C LNG bunker tank constructed of a new cryogenic, high-manganese steel developed by POSCO

March

- The new liquefaction train at Cove Point on the US East Coast, a facility commissioned originally as an import terminal 40 years ago, produced its first LNG export cargo
- Japan Petroleum Exploration (Japex) started commercial operations at its Soma import terminal, the company's first LNG receiving facility, in the Fukushima Prefecture port of Soma



LNGC are now arriving at the Cove Point terminal in Maryland to load cargoes, rather than discharge them

April

- Japan's Hokuriku Electric Power Co inaugurated its Toyama-Shinko LNG receiving terminal in Toyama Bay on Japan's west coast with a shipment from Malaysia
- The European Commission cleared the purchase by Total of US\$1.5 billion of LNG assets controlled by Engie

May

- The Zuetina terminal in war-torn Libya exported its first LPG shipment in four years; the cargo from the re-opened export facility was transported to Italy in the 9,100 m³ *Gaz Concord*
- Cameroon became the world's 20th LNG exporter with the dispatch of the first cargo from the floating LNG production (FLNG) vessel *Hilli Episeyo*
- Cheniere sanctioned the construction of a third 4.5 mta liquefaction train for its new greenfield LNG export project in Corpus Christi, Texas

June

- Panama became the 42nd member of the LNG importers club following the discharge of a commissioning cargo at the Costa Norte terminal in Colon, close to the Caribbean entrance of the Panama Canal, by the 154,500 m³ *Provalys*.

July

- Yamal shipped its first LNG cargo to China via Northern Sea Route

The 35,000 m³ ethylene carrier *Navigator Aurora* became first gas ship to have its slow-speed diesel engine converted to enable it to also run on ethane

Mitsubishi Heavy Industries completed the 165,000 m³ Moss spherical tank ship *Diamond Gas Orchid*, the world's first LNG carrier designed to the Sayaringo STaGE concept



Navigator Aurora was the first gas ship to have its slow-speed diesel engine converted to enable it to also run on ethane

Gas shipping and terminal timeline 2018

August

- The FSRU *Excellence* began regasifying Bangladesh's first LNG import cargo

CNOOC's new Shenzhen LNG import terminal commenced operations; the facility is CNOOC's 10th and China's 20th LNG receiving terminal

- Conrad Industries delivered the non-propelled barge *Clean Jacksonville*, North America's first LNG bunker vessel
- ENN Group's Zhoushan LNG receiving terminal, China's 21st such facility, received its first commissioning cargo

September

- Tema LNG approved an LNG import scheme based on the use of a barge-based floating regasification unit (FRU in combination with an FSU moored at Tema in Ghana

Panama Canal traffic

The volume of LNG transiting the Panama Canal during fiscal year 2018 (FY2018, the 12 months to 30 September 2018) jumped 81 per cent year-on-year, to 11.5 million tonnes (mt). LNG traffic through the Panama Canal in FY 2021 is expected to rise to 28 mt and, in a move to accommodate the planned increase in such shipments, the Panama Canal Authority added a second daily LNGC transit slot through the enlarged locks in October 2018. Transits of VLGCs carrying LPG through the Canal over the past year have been more than double those of LNGCs; LPG carriers account for 26 per cent of Neopanamax vessel transits of the Canal while LNG carriers account for 11 per cent.

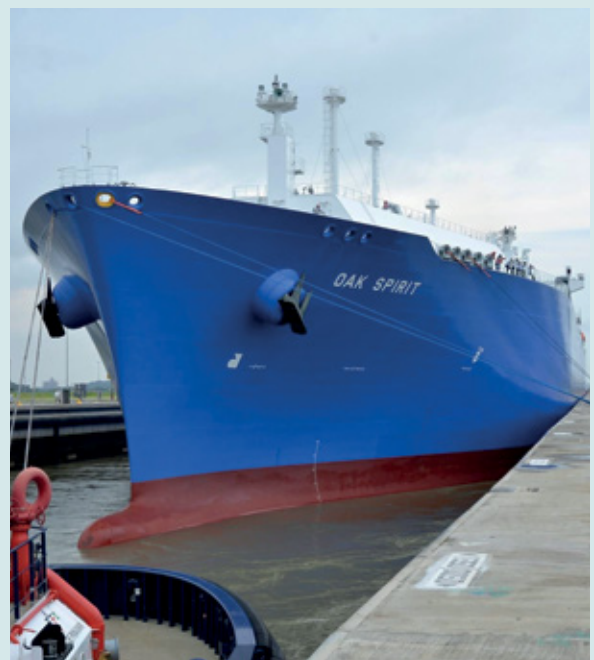
October

- The first LNG export cargo was shipped from the new Ichthys terminal at Darwin in northern Australia



The Ichthys terminal exports both LNG and LPG

- Shell and its partners in the LNG Canada export terminal planned for Kitimat in British Columbia decided to go ahead with the two-train, 14 mta project
- After three years of importing LNG, making use of two FSRUs, Egypt ceased its LNG purchases amidst efforts to reinvigorate exports of the product



The volume of LNG moving through the Panama Canal is set to almost treble over the next three years

November

- Yamal LNG completed the first of a significant number of ship-to-ship LNG transfer operations at Honningsvåg fjord in northern Norway



The icebreaking LNGC *Vladimir Rusanaov* transships a Yamal LNG cargo to Pskov at Honningsvåg fjord for onward delivery to the final customer

- On the basis of monthly volumes, Australia overtook Qatar as the world's leading LNG exporter in November
- *Hellas Gladiator* departed the Ichthys LNG exported terminal in Darwin, Australia with the facility's inaugural LPG cargo

Summary

The seaborne trade in LNG increased by 8.3 per cent year-on-year in 2018, to reach 314 million tonnes (mt), following expansions of 9.9 per cent in 2017 and 7.5 per cent in 2016. The annual trade growth in 2018 was the LNG industry's third largest on record, after 2010 and 2017. Australia recorded the largest jump in exports in 2018; shipments from the country jumped by 11.1 mt, to reach 66.7 mt. On the import side of the equation, China was the biggest gainer. Purchases in 2018 reached 54.0 mt, a year-on-year rise of 14.9 mt.



The buildup in shipments from the new Gorgon project helped Australia boost year-on-year LNG exports by 20 per cent in 2018

December

- BP and its partners gave the green light to their FLNG-based Tortue export scheme for the coastal waters of Senegal and Mauritania
- Cheniere Energy's greenfield Corpus Christi LNG export terminal in Texas dispatched its first commissioning export cargo
- The Russian enclave of Kaliningrad commenced LNG imports with the arrival of the 174,000 m³ FSRU *Marshal Vasilevskiy* and an inaugural cargo at a purpose-built offshore jetty
- Exceleerate Energy officially withdrew from its long-running plan to provide the FSRU-based Aguirre Offshore GasPort LNG import project in Puerto Rico; similarly, ExxonMobil stated it will not proceed with its West Coast Canada (WCC) LNG export project planned for British Columbia
- ADNOC completed the industry's first co-loading of LPG and propylene cargoes on the same vessel at its Ruwais terminal in Abu Dhabi; the VLGC took onboard 12,600 tonnes of propylene and 33,000 tonnes of LPG
- Jamaica's status as an LNG importer increased a level with the replacement of an FSU by its first FSRU, the 125,000 m³ *Golar Freeze*, at a purpose-built offshore jetty in Old Harbour

A total of 56 LNGCs were delivered in 2018 while 74 newbuildings were contracted during the year, both records. The global fleet of LNGCs stood at 563 vessels at the end of 2018, while 138 such vessels were on order.

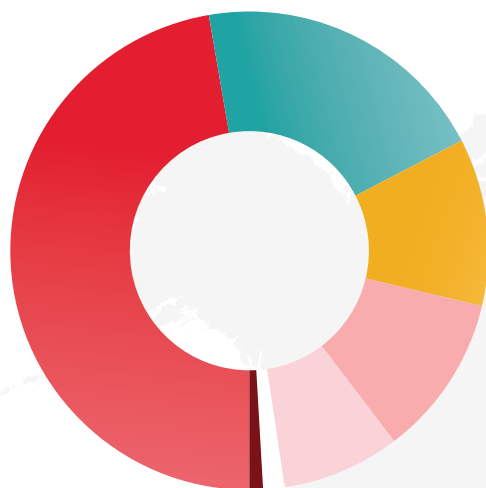
Of the 96.4 mt of LPG moved by sea in 2018, over 80 per cent was carried by fully refrigerated very large gas carriers (VLGCs) of 75,000 m³ and above on deepsea routes. For example, VLGCs loaded more than 85 per cent of the 31 mt of LPG exported from the US during the year. Although the Middle East remains the world's largest LPG export region, with 38.7 mt loaded, US overseas shipments continue to grow strongly. US LPG exports are expected to top 40 mt in 2020.

At the end of 2018 there were 268 VLGCs in service, following a net addition of six vessels, and 40 such ships on order.

LPG carrier fleet by type, age, flag state and owner nation

LPG ANNUAL REPORT 2018

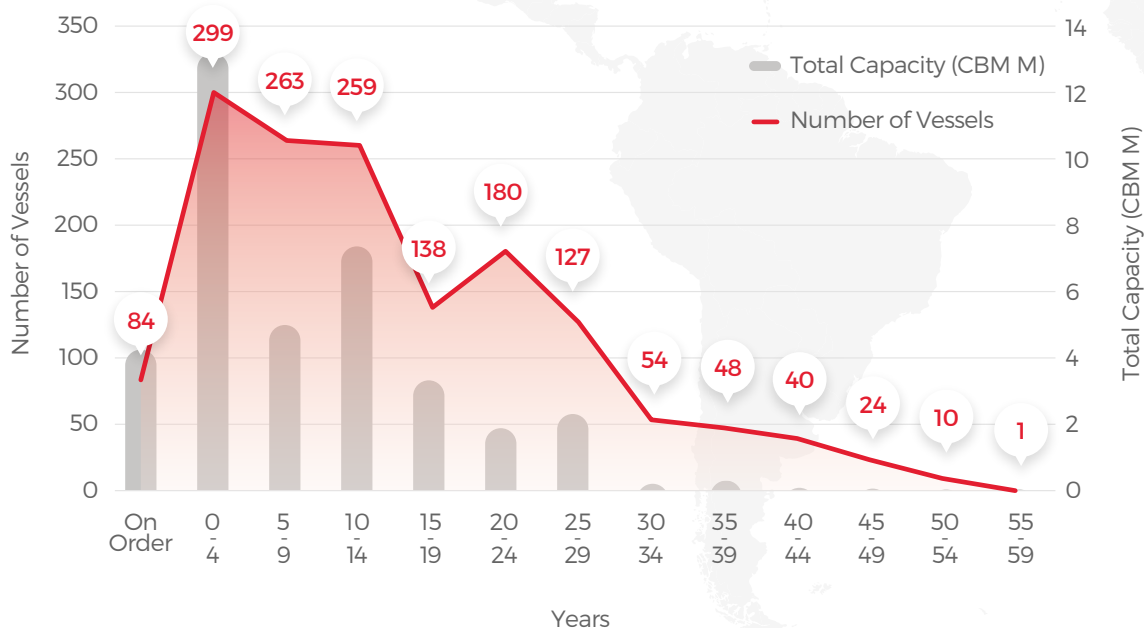
LPG FLEET BY NUMBER OF VESSELS



| LPG Type | Number of Vessels | Total Capacity (CBM M) |
|-------------------|-------------------|------------------------|
| Fully Pressurised | 722 | 2.44 |
| VLGC | 307 | 25.15 |
| LEG | 173 | 1.97 |
| SP FR LPG | 167 | 1.84 |
| MGC | 122 | 4.12 |
| LGC | 22 | 1.31 |
| VLEC | 14 | 1.26 |

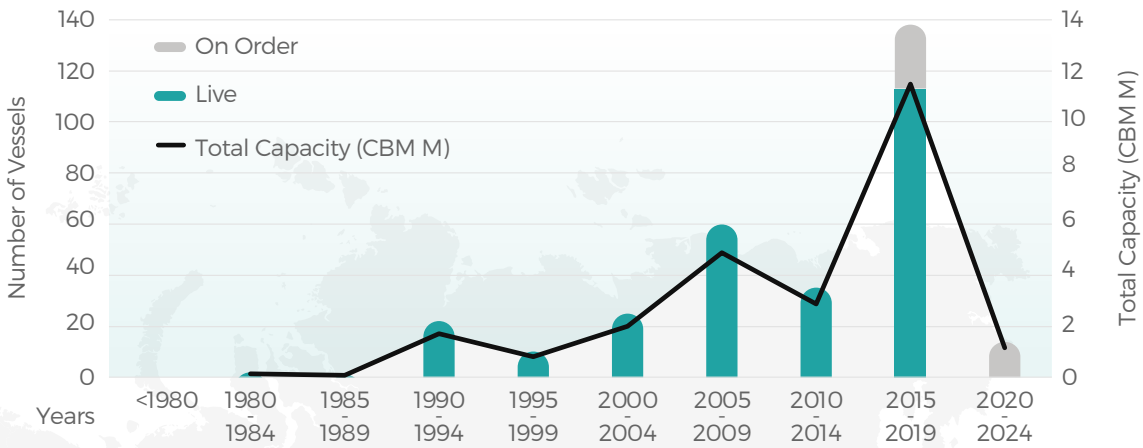
Total of **1,527** vessels **84** of which are currently on order

LPG FLEET AGE PROFILE

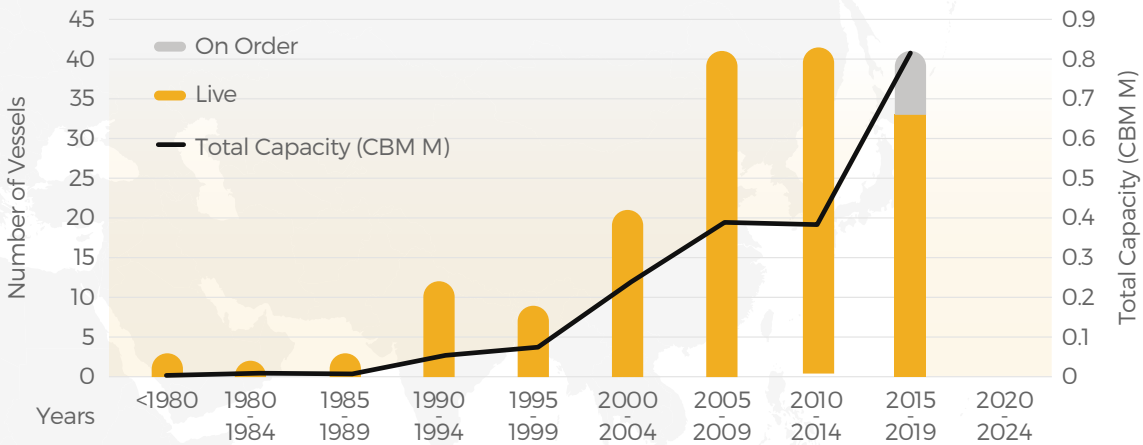


Source: VesselsValue as of April 2019
Does not include floating production vessels.

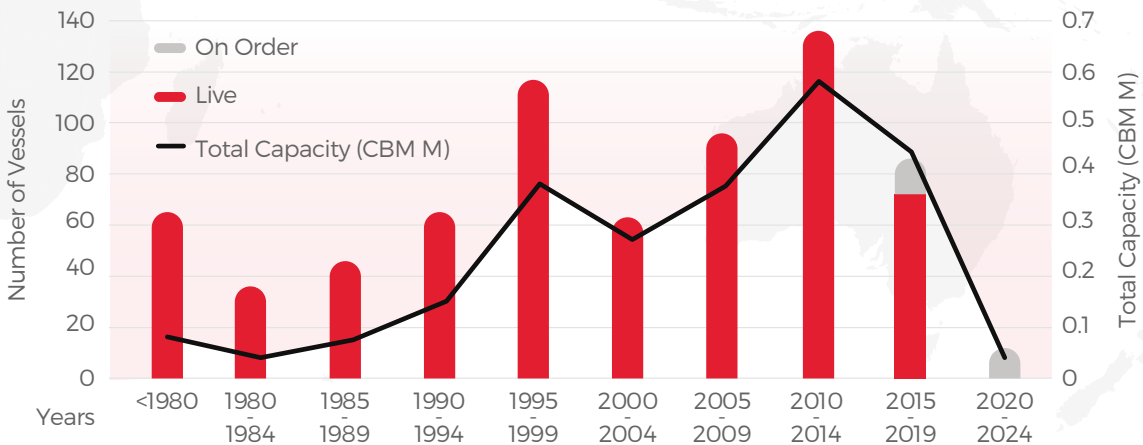
VLGC DELIVERY SCHEDULE



LEG DELIVERY SCHEDULE



FULLY PRESSURISED DELIVERY SCHEDULE



Source: VesselsValue as of April 2019
Does not include floating production vessels.

Fully pressurised vessels account for almost 50 per cent LPG carrier numbers but less than 7 per cent of the LPG fleet's carrying capacity



SIGTTO engagement in IMO rulemaking process



Ambitious goals are being set for the reduction of greenhouse gas emissions from commercial shipping, including gas carriers

At any one time a number of rulemaking initiatives are underway at the International Maritime Organization (IMO), the European Union (EU) and the US Coast Guard (USCG) which impact gas carrier operators engaged in international trade. Because close alignment of systems and procedures at the ship/shore interface is critical to safe and reliable gas ship operations, many maritime legislative decisions also affect terminal operators.

SIGTTO plays a key role in the rulemaking processes of the various agencies, contributing information necessary for the drafting of sound and effective regulations; representing member interests on issues of gas ship safety and reliability; and disseminating the results of the progress being made at the various regulatory meetings amongst the membership.

IMO is the leading international body for maritime safety and environmental protection affairs and

has a busy schedule of committee and subcommittee meetings each year. The following paragraphs detail IMO considerations impacting on the design, construction and operation of gas carriers during the course of 2018.

Gas carrier firefighting

Following a proposal, IMO's Maritime Safety Committee, at its 98th Session (MSC 98) in June 2017, agreed to consider amendments to the *Guidelines for the approval of fixed dry chemical powder fire-extinguishing systems for the protection of ships carrying liquefied gases in bulk (MSC.1/Circular 1315)*.

The proposal highlighted the lack of detailed "fire-extinguishing capability test" requirements and the fact that the current guidelines specify only the use of powder based on the salts of potassium when other media are available.

The technical detail and proposed amendments to MSC.1/Circ.1315 were placed on the agenda for discussion at

the 5th Session of IMO's Sub-committee on Ships Systems and Equipment (SSE 5) in March 2018. At SSE 5 it was agreed that sodium bicarbonate-based powders should be excluded from use as dry chemical powder on ships carrying liquefied gases in bulk.

However, it was further recognised that all dry chemical powders in use were mixtures (containing additives in traces) and that a single compound dry powder did not exist. Therefore, it would be necessary to further develop criteria according to which a dry powder could be considered as a sodium bicarbonate powder (e.g. mass percentage of the main compound), as opposed to a sodium-based dry powder.

It was also agreed that dry chemical powder other than sodium bicarbonate should be approved by the relevant flag administration in accordance with recognised international standards; and that a specific fire-extinguishing capability test might be necessary within the Guidelines. >

Regulations and Standards



The first maritime application of Posco's new high-manganese steel is in the Type C LNG bunker tank supplied for the 50,000 dwt, dual-fuel bulk carrier Green Ilshin

A correspondence group was formed to progress the work intersessionally to:

- (a) develop draft acceptance criteria for dry chemical powders in terms of fluidity, moisture behaviour and suitability for use on board ships carrying liquefied gases in bulk, with a view to establishing performance and testing requirements;
- (b) develop draft acceptance criteria for dry chemical powders in terms of fire-extinguishing capabilities, with a view to establishing performance and testing requirements; and
- (c) identify available standards and best practices relevant to the maritime sector, as well as possible gaps in the existing international regulations.

In another fire protection-related decision at SSE 5 a proposed Unified Interpretation (UI) dealing with the definition of “cargo area” in the International Gas Carrier (IGC) Code 11.1.4 for the purposes of firefighting arrangements was accepted. It was agreed that when there is a fuel tank adjacent to the cargo area, the weather deck area above should be considered as “cargo area”, in the same way that a void space or ballast tank would be.

Greenhouse gas emissions (GHGs)

In April 2018, at its 72nd session, IMO's Marine Environment Protection Committee (MEPC 72) adopted the *Initial IMO Strategy on reduction of GHG emissions from ships*, the most notable aspect being the “levels of ambition”, expressed as:

.1 carbon intensity of the ship to decline through implementation of further phases of the energy efficiency design index (EEDI) for new ships

to review with the aim to strengthen the energy efficiency design requirements for ships with the percentage improvement for each phase to be determined for each ship type, as appropriate;

.2 carbon intensity of international shipping to decline

to reduce CO₂ emissions per transport work, as an average across international shipping, by at least 40% by 2030, pursuing efforts towards 70% by 2050, compared to 2008; and

.3 GHG emissions from international shipping to peak and decline

to peak GHG emissions from international shipping as soon as possible and to reduce the total annual GHG emissions by at least 50% by 2050 compared to 2008 whilst pursuing efforts towards phasing them out as called for in the Vision as a point on a pathway of CO₂ emissions reduction consistent with the Paris Agreement temperature goals.”

IMO will now continue to work on possible measures to achieve this ambition at future sessions of MEPC.

Global sulphur cap 2020

IMO is developing guidelines for the *Consistent implementation of regulation 14.1.3 of MARPOL Annex VI* and work continued during an intersessional meeting in July 2018. The scope of the

guidelines includes preparatory and transitional issues that may arise with a shift from the 3.50% m/m sulphur limit in ship fuel to the new 0.50% m/m limit by 1 January 2020; impact on fuel and machinery systems that may result from the use of fuel oils with a 0.50% m/m sulphur limit; verification issues and control mechanisms and actions that are necessary to ensure compliance and consistent implementation; and development of a draft standard format (a standardised system) for reporting fuel oil non-availability.

The Oil Companies International Marine Forum (OCIMF) and the International Petroleum Industry Environmental Conservation Association (IPIECA) informed the intersessional meeting that, to assist with safety aspects of the transition, they are facilitating the development of industry safety guidelines for submission to IMO.

High-manganese steel

At its 5th Session in September 2018 IMO's Sub-Committee on the Carriage of Cargoes and Containers (CCC 5) agreed to a draft Maritime Safety Committee (MSC) circular on *Interim Guidelines on the application of high manganese austenitic steel for cryogenic service* and to expand the terms of reference to include related guidance for approving alternative metallic material for cryogenic service more generally. Both the Guidelines and the expanded terms of reference were subsequently approved at

the 100th MSC Session (MSC 100) in December 2018. An IMO correspondence group is engaged in compiling the expanded terms of reference.

The development of the interim guidelines was spurred by the development of the new steel for cryogenic service by POSCO, the Korean steel manufacturer. The material contains about 20 per cent manganese and possesses a high yield strength and toughness at the LNG carriage temperature of -162°C.

Gas cargo minimum requirements

The UK proposed to make consequential amendments to Chapter 19 of the revised International Gas Carrier (IGC) Code, which entered into force in 2016. Chapter 19 provides a summary of the minimum requirements for gas carrier cargoes, and the amendments are deemed to be necessary to correct those anomalies introduced during the revision process that result in differences between the “old” and “amended” Codes.

CCC 5 acknowledged that the list of products as provided in Chapter 19 of the IGC Code for ships constructed on or after 1 July 1986 and before 1 July 2016 was not up-to-date. As an interim solution, a draft MSC circular clarifying the issue was agreed for submission to MSC 101 for approval in June 2019.

IGC Code Unified Interpretations

The intent of paragraph 11.3.4 of the IGC Code concerning the capacity of the emergency fire pump, considering the supply of fire hydrants, the water spray system and foam system (and combinations thereof), was raised by the International Association of Classification Societies (IACS). Clarification was sought on the text and in particular whether a single failure mode philosophy should be applied. CCC 5 agreed it should, and it is expected that a Unified Interpretation (UI) will be submitted to the next CCC session.

A UI was proposed concerning inert gas system isolation (paragraph 9.4.4 of the IGC Code) suggesting that:

(a) for the inert gas main which has branch lines, each of such branch lines

in the cargo area may be fitted with a removable spool piece in lieu of that in the common inert gas main; and (b) “a removable spool piece” may be replaced by “a double block and bleed valve”. The UI was seen as a change to the intent of the Code and hence rejected.

A detailed UI was proposed to clarify the requirements for deck water spray systems (paragraphs 11.3.1, 11.3.3 and 11.3.4 of the IGC Code) concerning, respectively:

- (a) what constitutes “two complete athwartship tank groupings”;
- (b) the interconnections between the spray and fire systems; and
- (c) the capacity of the fire pumps serving water spray systems and protection of exposed survival craft with water spray.

UIs were agreed on all issues except for paragraph 11.3.4 of the Code. CCC 5 also noted concerns regarding the reference to “fire in one compartment” and it is expected a further UI will be submitted to the next session on this point.

IACS submitted a UI concerning the required heating for the structural material of the cargo containment systems and emergency power requirements. Paragraph 4.19.1.6 of the IGC Code requires the means of heating to “... be arranged so that, in the event

of failure in any part of the system, standby heating can be maintained equal to not less than 100% of the theoretical heat requirement”. The UI clarifies the aspects of the system that should be powered by the emergency generator and this was accepted by the Sub-committee at its 5th Session.

IACS also proposed a UI to clarify the requirements for emergency shutdown valve fire test requirements (paragraph 5.13.1.4 of the IGC Code) to allow material with a melting temperature lower than 925°C in components such as rubber handle covers (where failure would not cause deterioration of shell or seat tightness intrinsically). CCC 5 agreed to the proposed IACS text, albeit with a slight modification.

Energy Efficiency Design Index

IMO’s Marine Environment Protection Committee (MEPC) is carrying out a review of the Energy Efficiency Design Index (EEDI) provisions applicable to new ships, including gas carriers. A correspondence group (CG) is reviewing the Phase 3 requirements with a view to potentially changing the implementation date and emission reduction requirements. This CG will report to MEPC’s 74th Session (MEPC 74) in May 2019 when a decision is anticipated.



A number of Unified Requirements proposed by IACS, concerning gas ship fire protection arrangements, were discussed at the September 2018 session of IMO’s Carriage of Cargoes and Containers Sub-committee

Enhancing industry best practice guidance library



SIGTTO's new manifold publication includes provisions which assist in planning the position of loading and discharging facilities on new jetties

As indicated in last year's SIGTTO Annual Report, working groups established by the Society's General Purposes Committee (GPC) completed drafting work on three new sets of industry best practice guidelines in 2017. Following approval, the three documents - *Recommendations for Liquefied Gas Carrier Manifolds*, *Ship/Shore Interface for LPG/Chemical Gas Carriers and Terminals* and *Guidelines for the Alleviation of Excessive Surge Pressures on ESD for Liquefied Gas Transfer Systems* were published in early 2018. The three sets of guidelines brought the number of paid publications that SIGTTO had delivered over the previous four years to eight.

Recapping the 2018 trio

Preparation of the *Recommendations for Liquefied Gas Carrier Manifolds* publication was a joint initiative between SIGTTO and the Oil Companies International Marine Forum (OCIMF). It is also the Second Edition of the document and updates the inaugural 2011 edition, which provided recommendations on the layout, strength and fittings for gas carrier manifolds.

The Second Edition brings together, in one document, the manifold arrangements and cargo strainer guidelines for LNG, LPG and chemical gas carriers in order to promote improved standards of safety and efficiency in ship operations. The guidance is also intended to assist in planning the position of loading and discharging facilities on new jetties. The recommendations do not apply to existing ships.

Amongst the key changes in the latest version of the manifold publication are new categories created for small-scale LNG and the extension of manifold provisions to include LNG bunkering as an option. SIGTTO and OCIMF recognise that some new gas carrier designs may not be able to conform to all the recommendations in the new Second Edition. However, the document is intended to serve as a starting point with a view to minimising differences as much as possible.

The draft first edition of the *Ship/Shore Interface for LPG/Chemical Gas Carriers and Terminals* guidance document was approved at the 77th GPC (GPC

77) meeting in April 2018. The new publication recognises the technological advances that have been made over the past two decades and supersedes a 1997 SIGTTO publication entitled *Ship/Shore Safe Working Practice for LPG and Chemical Gas Cargoes*.

SIGTTO prepared the new document to identify the potential hazards that can arise at the LPG/chemical gas ship/shore interface; to provide safe working practice guidelines through reference to industry publications; to minimise the risk of incidents occurring; and to help raise overall safety awareness at the interface.

As part of highlighting the principal risks present in the interface zone, the publication describes risk assessment and hazard identification techniques that gas carrier staff and terminal operators are able to make use of.

In many respects the interface between LPG/chemical gas carriers and terminals is a more complex zone than that encountered in the LNG sector. Whereas LNG carrier and terminal operators are dealing with a homogeneous cargo, staff handling LPG and chemical gas carrier cargo transfers have to deal with a matrix that encompasses a range of different cargoes, temperatures and pressures as well as a variety of vessel and terminal types.

The new *Guidelines for the Alleviation of Excessive Surge Pressures on ESD for Liquefied Gas Transfer Systems* publication was also approved at GPC 77. SIGTTO prepared the document to enable project teams and operators of terminals and liquefied gas carriers to review the design, engineering and operation of their cargo transfer systems. Such reviews may assist in avoiding the generation of excessive surge pressures and momentum change in transfer systems on activation of emergency shutdown (ESD) devices or other events.

The purpose of this document is to provide familiarisation with the concepts of surge pressure and to provide practical guidance and

recommendations to the designers, engineers and operators of liquefied gas carrier and terminal loading and unloading systems. The document's description of the generation of surge pressures features both a high-level overview and a more detailed technical explanation so that it is applicable to surge experts and novices alike. One recommendation that is particularly highlighted is the practice of utilising linked ship/shore ESD arrangements as an effective means of reducing surge pressure.

Next round of publications

As indicated by the descriptions of the current work programmes of SIGTTO's General Purposes and Human Element Committees (GPC and HEC) on page 14, working groups and a new subcommittee established by the two bodies have made considerable progress over the past 18 months on projects to compile new sets of industry best practice guidelines.

While the majority of these will be published over the next year, the first has already appeared.

Recommendations for Management of Cargo Alarm Systems was issued as a free publication in spring 2019 and represents the first document to be prepared by HEC.

The publication recommends the implementation of alarm management philosophies for cargo alarm systems on gas carriers, specifically calling for shipowners to work with system designers, classification societies and shipyards to create a management system for cargo alarms on each ship. Information in the document is based on existing philosophies in the International Safety Management (ISM) Code, the Code on Alerts and Indicators, the International Gas Carrier (IGC) Code and the IEC 62682 standard dealing with the management of alarm systems used in the process industries. Alarm management is a good example of how human element considerations can lead to improved safety performance.

Recommendations for Management of Cargo Alarm Systems was compiled

by HEC's Cargo Control Room (CCR) Ergonomics Working Group. The CCR Group has already moved on and is now focusing on cargo control room layout and ergonomics, considering aspects such as control station layout, physical environment, operator interface, controls, displays and the human/machine interface (HMI). The aim is to develop guidance for operators on how to improve the safety of cargo operations through detailed consideration of operational practice within the specification and design of CCR workstations and HMI.

Another new Society publication that has appeared recently is *SIGTTO Information Papers (Consolidated Edition 2019)*. Compiled as a handy, single-volume reference tool for use by the industry, the document brings together all the SIGTTO Information Papers that were in force as of March 2019. The contents of the publication are as follows:

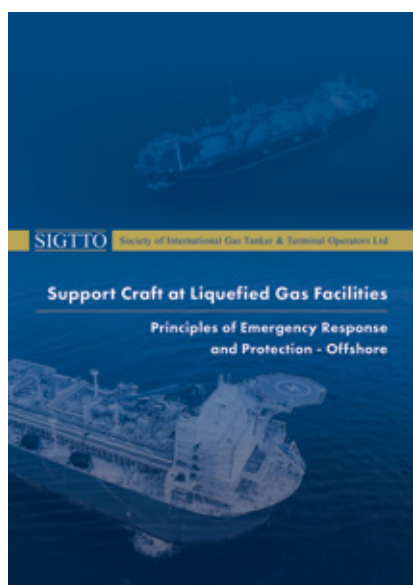
1. A Justification into the Use of Insulation Flanges (and Electrically Discontinuous Hoses) at the Ship/Shore and Ship/Ship Interface

2. ESD Arrangements & Linked Ship/Shore Systems for Liquefied Gas Carriers
3. ESD Arrangements & Linked Ship/Shore Systems for Liquefied Gas Carriers (2009) – Addendum
4. Fire Prevention in the Cargo Containment Systems of Liquefied Gas Carriers in Shipyards
5. Gas Concentrations in the Insulation Spaces of Membrane LNG Carriers
6. Guidance for the Prevention of Rollover in LNG Ships
7. Guide for Planning Gas Trials for LNG Vessels
8. LNG and LPG Experience Matrix (Including Guidelines for Use)
9. LNG Marine Loading Arms and Manifold Draining, Purging and Disconnection Procedure
10. Report on the Effects of Fire on LNG Carrier Containment Systems
11. Simulation Information Paper
12. Suggested Quality Standards for LNG Training Providers
13. Thermowells in LNG Carrier Liquid Lines
14. The Selection and Testing of Valves for LNG Applications
15. The Selection and Testing of Valves for LPG Applications



The selection and testing of valves for LNG applications is one of 15 topics covered in the new consolidated edition of SIGTTO Information Papers

SIGTTO paid publications



SIGTTO Information Papers, Consolidated Ed 2019 (2019; £175.00)

Recommendations for Liquefied Gas Carrier Manifolds (2018; £175.00)

Ship/Shore Interface for LPG/ Chemical Gas Carriers and Terminals (2018; £175.00)

Guidelines for the Alleviation of Excessive Surge Pressures on ESD for Liquefied Gas Transfer Systems (2018; £175.00)

LNG Emergency Release Systems - Recommendations, Guidelines and Best Practices (2017; £125.00)

Liquefied Gas Handling Principles on Ships and in Terminals, 4th Ed (LGHP4) (2016; £275.00)

Support Craft at Liquefied Gas Facilities: Principles of Emergency Response and Protection - Offshore (2016; £125.00)

Support Craft at Liquefied Gas Facilities: Principles of Emergency Response and Protection - Onshore (2015; £125.00)

Guidance for LNG Carriers Transiting the Panama Canal (2014; £125.00)

Ship-to-Ship Transfer Guide for Petroleum, Chemicals and Liquefied Gases (2013; £275.00)

Liquefied Gas Carriers: Your Personal Safety Guide (2012; £25.00)

Application of Amendments to Gas Carrier Codes Concerning Type C Tank Loading Limits (2012; £25.00)

Liquefied Petroleum Gas Sampling Procedures (2010; £25.00)

LNG Steamship Suggested Competency Standards for Engineers (2010; £125.00)

LPG Shipping Suggested Competency Standards (2008; £125.00)

LNG Shipping Suggested Competency Standards, 2nd Ed (2008; £125.00)

Jetty Maintenance and Inspection Guide (2008; £175.00)

Hydrates in LPG Cargoes (2008; £75.00)

Liquefied Gas Fire Hazard Management (2004; £175.00)

Crew Safety Standards and Training for Large LNG Carriers: Essential Best Practices for the Industry (2003; £75.00)

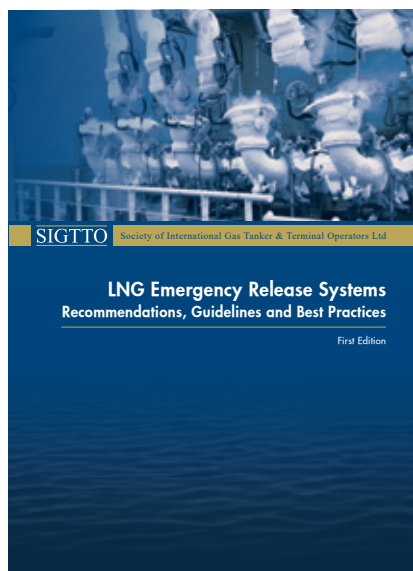
LNG Operations in Port Areas (2003; £75.00)

Guide to Contingency Planning for Marine Terminals Handling Liquefied Gases in Bulk, 2nd Ed (2001; £40.00)

Guidelines on the Ship-Board Odourisation of LPG (2000; £40.00)

An Introduction to the Design and Maintenance of Cargo System Pressure Relief Valves Onboard Gas Carriers, 2nd Ed (1998; £40.00)

Site Selection & Design for LNG Ports & Jetties (Information Paper No 14) (1997; £40.00)



Details of more than 60 free SIGTTO publications, newsletters, annual reports and articles are given on the Society's website: www.sigtto.org

SIGTTO

Society of International Gas Tanker and Terminal Operators Limited

Statement of Comprehensive Income for the year ended 31 December 2018

| | <u>Note</u> | <u>2018</u> £ | <u>2017</u> £ |
|--|-------------|------------------|------------------|
| Revenue | | | |
| Members' annual dues | | 1,347,552 | 1,333,349 |
| Royalties | | 302,479 | 179,450 |
| Interest receivable | | 7,373 | 1,042 |
| | 2(b) | 1,657,404 | 1,513,841 |
| Expenditure | | | |
| Employee benefit expense | 4 | 641,307 | 524,192 |
| Office supplies, web and library costs | | 64,484 | 60,922 |
| Members' meetings | | 239,678 | 200,905 |
| Rents, rates and services | | 267,853 | 125,643 |
| Professional fees | | 304,086 | 292,389 |
| Project costs | | 14,454 | 18,552 |
| Communications | | 4,776 | 3,949 |
| Depreciation | 5 | 55,023 | 4,695 |
| Miscellaneous expenses | | 14,787 | 6,737 |
| | | 1,606,448 | 1,237,984 |
| Surplus for the year | | 50,956 | 275,857 |

The society has no items of other comprehensive income.

SIGTTO

Statement of Financial Position at 31 December 2018

| | <u>Note</u> | <u>2018</u> £ | <u>2017</u> £ |
|-------------------------------------|-------------|------------------|------------------|
| Non-current Assets | | | |
| Property, plant and equipment | 5 | 258,570 | 12,786 |
| | | <u>258,570</u> | <u>12,786</u> |
| Current Assets | | | |
| Trade and other receivables | 6 | 650,477 | 940,352 |
| Cash and cash equivalents | | 2,558,876 | 2,619,505 |
| | | <u>3,209,353</u> | <u>3,559,857</u> |
| Total Assets | | <u>3,467,923</u> | <u>3,572,643</u> |
| Current Liabilities | | | |
| Trade and other payables | 7 | 627,566 | 784,328 |
| Total Liabilities | | <u>627,566</u> | <u>784,328</u> |
| Capital and Reserves | | | |
| Called up share capital | 8 | 34,020 | 32,934 |
| Retained earnings | | 2,806,337 | 2,755,381 |
| Total Equity | | <u>2,840,357</u> | <u>2,788,315</u> |
| Total Liabilities and Equity | | <u>3,467,923</u> | <u>3,572,643</u> |



PHOTO CREDITS: Front cover - Evergas; Page 2 - BW Gas; Page 4 - BW Gas; Page 6 - Mitsui OSK Lines; Page 10 - MISC; Page 11 - Avance Gas Holding; Page 14 - OLT Offshore LNG Toscana; Page 16 - Anthony Veder; Page 20 - Qatar Petroleum (Industrial Cities Ports); Page 22 - Teekay; Page 22 - Kawasaki Kisen Kaisha; Page 23 - Sovcomflot; Page 23 - Chevron; Page 27 - Bernhard Schulte Shipmanagement; Page 35 - Cameron LNG; Back cover - Höegh LNG



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