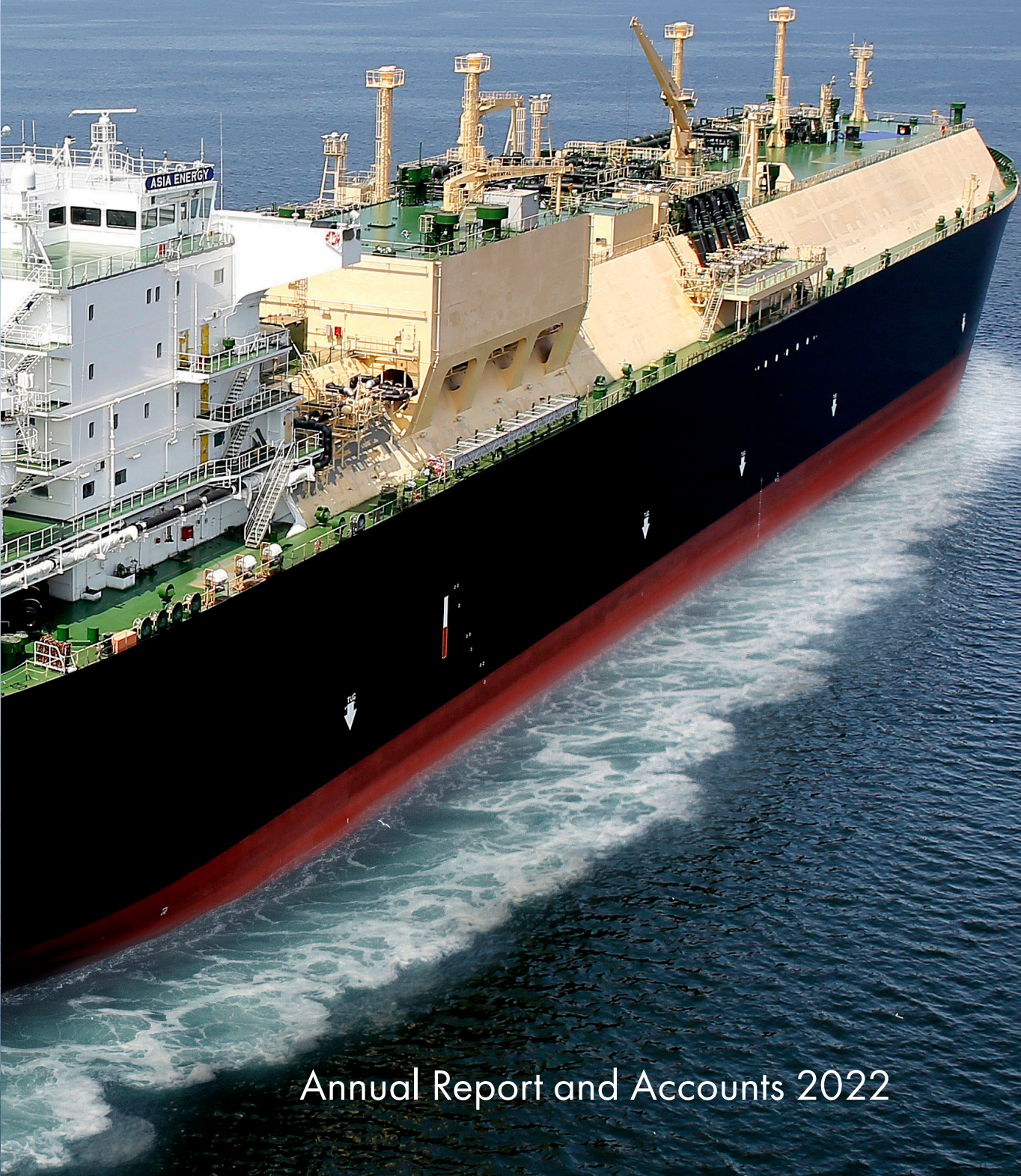


SIGTTO

The Society of International Gas Tanker and Terminal Operators Ltd

Continually promoting best practice in the liquefied gas shipping and terminal industries for 44 years.



Annual Report and Accounts 2022



The Society of International Gas Tanker and Terminal Operators (SIGTTO) is a non-profit making organisation dedicated to protecting and promoting the mutual interests of its members in matters related to the safe and reliable operation of gas tankers and terminals within a sound environment.

The Society was founded in 1979 and was granted consultative status at the International Maritime Organization in November 1983.

www.sigtto.org



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President's Report



Lloyd Bland
SIGTTO President

I would like to open with saying what a privilege and honour it is for me to assume the role of President of the Board and to work collectively with the membership as we navigate the energy transition. As per our byelaws, the term of this period is three years, as which time it will transition to Rahul Kulkarni from BP, whom I'm pleased to announce was elected by the Board to assume the Vice President role. Giovanni Giorgi from OLT Offshore LNG Toscana has assumed the role of the General Purposes Committee (GPC) Chair and Eleni Lazaratou from Maran Gas has assumed the role of GPC Vice Chair.

I want to thank Steffen Jacobsen for his leadership at SIGTTO, serving in the capacity of President of the Board of Directors for the last three years, prior to handing off to me at the end of 2022. As many may know, this was Steffens' second time serving in this capacity, having made significant contributions to the Society over his career on the General Purposes Committee (GPC) and as a Board Member. This is even more impressive given the challenging time due to the pandemic, changes at SIGTTO and new IMO legislation. His years of experience, friendly demeanour, guidance, and counsel to the Board will be missed and we wish him the best with his future endeavours.

Looking back, 2022 was a year of transition for SIGTTO and our industry. We were very fortunate to have had the steady hand of Andrew Clifton as General Manager and Chris Clucas supporting us through the interim while the Board completed an extensive executive search. I am very pleased to welcome Ian Revell as our new CEO. It is a challenging role that

is compounded by rapid developments in the energy transition, GHG reduction targets, and associated regulations.

Ian brings a wealth of experience and leadership to take a fresh look at SIGTTO and how to better serve the membership. I encourage you to please take the opportunity to reach out to Ian with your perspectives on the challenges and opportunities that lie ahead for our industry, and how SIGTTO can best support its members.

When we talk of transition, this inexplicably goes hand in hand with change. SIGTTO's ability to meet growing membership needs and address new opportunities depends on our ability to evolve as an organisation. The pace of legislation, breadth of commercially viable bulk liquefied gasses within our remit and associated technologies are complex and will require additional resources.

While our commitment to safe transportation of liquefied gases will always be our foundation, our expanding focus on environmental performance is essential to navigate these evolving challenges and opportunities. The elevation of the Environmental Committee is an important step forward in building out this capability.

The broad and diverse issues that we face also requires that we refresh SIGTTO's strategy to reflect these growing demands. This work started at the end of 2022 and is on track to complete in the second half of 2023. The Board has contributed significant efforts to ensure this encompasses each area of our membership's operations. We look forward to sharing the updated strategy with you in the near-term.

In closing and considering our commitment to safety, I believe we can and should do more to share incidents broadly and often across the membership. The learnings from these incidents are very important, and if we do not take them onboard within our own organisations or the industry, the strong performance to date may be impacted. I would encourage you to please reach out to SIGTTO with your lessons learnt from incidents, so they can be shared anonymously with our membership. Maintaining a healthy sense of vulnerability and continuing to learn from these incidents will only strengthen our resolve to ensure safe and reliable transportation of bulk liquefied gases.

CEO's Report



Ian Revell
SIGTTO CEO

In 2022, the liquefied gas industry has grown significantly by over 4.5%. These are challenging days in the energy industry, driven by energy security concerns in uncertain times. SIGTTO's focus has remained on gas transportation safety and GHG reduction.

Following the departure of Captain Andrew Clifton after a long tenure as the General Manager of SIGTTO and an interim period with Chris Clucas at the helm, I was very pleased to take on leadership of SIGTTO. I would like to extend my sincerest thanks to Andrew and Chris for their respective contributions to the Society's development.

The Russia-Ukraine conflict has driven many changes in global energy, combined with other energy drivers pushing global seaborne gas demand to new levels.

New LNG trains have been established to cover the higher demand to Europe and Asia. The US may become the largest gas exporter by the end of 2023. New FLNG and FSRU projects have been approved and delivered in record time across Europe.

To facilitate the industry safety in this time of rapid growth, SIGTTO has continued to support the industry through committees and working group activities. The Environmental Committee (EC) has become a full committee to support new developments. The Working Groups are developing publication procedures in the key cargo transportations aspects of LNG, LPG, Ammonia, Methanol, Hydrogen and CO₂ to fulfil our safety mission.

The General Purposes Committee (GPC)

welcomed Giovanni Giorgi as the new Chair who brings fresh energy and many years of industry experience. We also welcomed Vice Chair, Eleni Lazaratou, to her new role in the GPC. We are confident this new leadership will add critical focus to the committee at an important time as the societal focus on maritime decarbonisation intensifies. In further exciting news, John Boreman is now the EC Chair, after previously offering his time and great insight as the interim GPC Chair. We are deeply appreciative of members who willingly participate and share their expertise.

We also provide extensive support to the redevelopment of the International Code of the Construction and Equipment of Ships Carrying Liquefied Gases in Bulk (IGC Code) and the technical aspects of the IMO Carriage of Cargoes and Containers (CCC). In this vein, SIGTTO published Liquefied Gas Cargo Resource Management Course, LPG Shipping Suggested Competency Standards, Measuring and Reporting of Gas Carriers CO₂ Emissions, Detection and Reporting of Fugitive Methane Emissions from LNG Carriers and SIGTTO Information Papers (Consolidated Edition) during 2022.

The 84th General Purposes Committee convened in Athens in April 2022, in addition to a panel meeting hosted by Maran Gas. London events this year included the Spring Board in May and later in the year, the 85th General Purposes Committee and a panel day. Finally, the Annual General Meeting and Board Meeting took place in Singapore in November and was hosted by Chevron. This was also followed by a panel day. It was great to see so many members join the events to share their own knowledge and learning in the industry, in keeping with SIGTTO's founding principles.

Our 2023-2028 Board Strategy planning highlights how SIGTTO can continue to provide exemplary regulatory and safety guidance as the industry evolves and reduces greenhouse gas. SIGTTO will expand its capabilities to meet future needs of the industry to facilitate a safe energy transition pathway for the Society.

Myself and the secretariat extend our sincere thanks to our members for their continuous commitment and contributions to gas industry safety. I look forward to working with you all in 2023.

SIGTTO in 2022

| | |
|---|---|
|  | <p>Established 43 years ago</p> |
|  | <p>39 years at IMO SIGTTO attended 10 meetings and submitted 6 papers in 2022</p> |
|  | <p>219 members 139 Full members 51 Associate members 29 Non-Subscribing Members</p> |
|  | <p>Global membership Asia Pacific 33%, Mediterranean 15%, Middle East 5%, Pan American 17%, Scandinavian 5%, Western European 23%</p> |
|  | <p>45 publications 24 Paid 21 Free</p> |
|  | <p>22 working groups and projects 20 General Purposes Committee 2 Environmental Committee</p> |



Avance Gas

SIGTTO Members

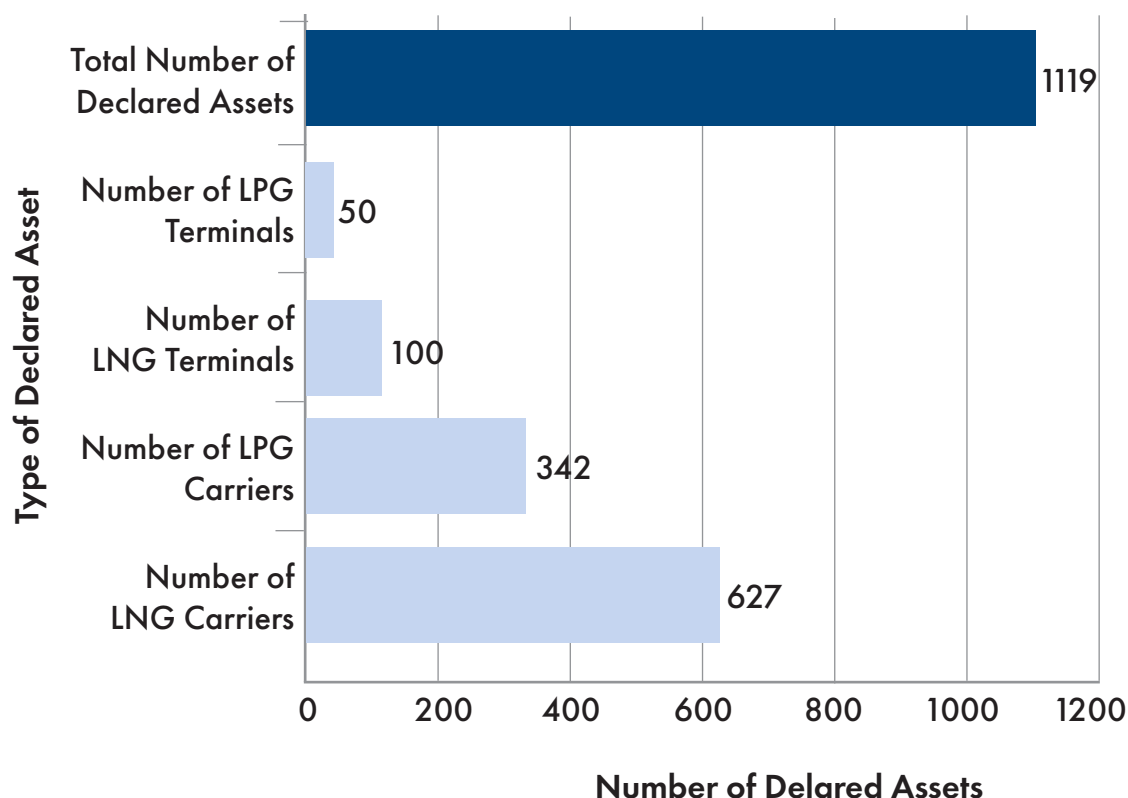
Full Members (as of 31 December 2022)

| | | |
|--|---|---|
| AES Andres | ExxonMobil - Seariver Maritime | Osaka Gas Co Ltd |
| Alphagas SA | Flex LNG | Pan Ocean Co Ltd |
| Angola LNG Limited | Fluxys LNG | Pavilion Energy Trading & Supply Pte Ltd |
| Angola LNG Marketing Limited | Freeport LNG Development, L.P. | Pertamina Transportation LNG - JMG |
| Anthony Veder Rederijzaken B.V. | Gaslog LNG Services Ltd | Petrobras – Petroleo Brasileiro S/A |
| Atlantic LNG Company of Trinidad & Tobago | Gate Terminal B.V. | Petronet LNG Limited |
| Avance Gas Holding Ltd | Gazocean | Posco Energy Co. Ltd, |
| Benhard Schulte Shipmanagement Limited | Geogas Maritime SAS | Prime Gas Management Inc. |
| B-GAS A/S | Global Meridian Holdings Limited | Pronav Ship Management |
| BP Berau Ltd | GNL Qunitero S.A. | PT Donggi Senoro LNG |
| BP Shipping Limited | Golar Mangement AS | PT Vektor Maritim |
| Brunei LNG SDN BHD | Golden Pass LNG | PTT LNG Company Limited |
| BW Epic Kosan | Hoegh LNG AS | Qatar Gas Transport Company Ltd |
| BW LNG AS | Hyproc Shipping Company | Qatarenergy |
| Byzantine Maritime Gas Pte Ltd | Hyundai LNG Shipping Co. Ltd. | Qatargas Operating Company Limited |
| Calor Gas Limited | Iino Kaiun Kaisha, Ltd | QCLNG Operation Company Pty Ltd |
| Cameron LNG | IndianOil LNG Private Limited | Saint John LNG Limited L.P. |
| Capital Gas Ship Management Corp | Ineos | Santos GLNG |
| Centrica LNG Company Limited | INPEX Corporation | Saudi Arabian Oil Co (Saudi Aramco) |
| Chandris (Hellas) Inc | International Gas Transportation Co. Ltd. | Seapeak Maritime (Canada) Inc |
| Chemgas Shipping B.V. | Japan Petroleum Exploration Co., Ltd. | Sempra Infrastructure |
| Cheniere LNG Inc | Jera Co., Incorporated | Shell International Trading & Shipping Co Ltd |
| Chevron Shipping Company LLC | Kawasaki Kisen Kaisha Ltd | Shipping Corporation of India |
| China LNG Shipping (International) Company Ltd | Kinder Morgan Inc | Shizuoka Gas Co Ltd |
| Conocophillips Global Marine | Knutsen OAS Shipping | Singapore LNG Corporation PTE Ltd. |
| Cool Company Management AS | Koch Shipping PTE Ltd | Sonangol Marine Services Inc |
| CPC Corporation, Taiwan | Kuwait Oil Tanker Co S.A.K. | South Hook LNG Terminal Co Ltd |
| DESFA Hellenic Gas Transmission System Operation | Latsco LNG Marine Mangement Inc | Stena LNG Holding Sweden AB |
| Dorian LPG Management Corp. | Latsco Marine Management Inc | STS Marine Solutions (UK) Ltd |
| Dragon LNG Limited | LNG HRVATSKA d.o.o. | Synergy Maritime PVT. Ltd |
| Dunkerque LNG | LNG Japan Corporation | Thenamaris LNG |
| Dynagas LTD | LNG Shipping S.P.A. | TMS Cardiff Gas Ltd |
| EGE Gaz Anonim Sirketi | Malaysia LNG SDN BHD | Toho Gas Co Ltd |
| Egyptian Operating Company for Natural Gas Liquefaction Projects | Maran Gas Maritime Inc | Tohoku Electric Power Co Inc |
| Elengy | Meiji Shipping Co. Ltd. | Tokyo Gas Co Ltd |
| Empressa Naviera Elcano S.A. | Minerva Gas Inc | TotalEnergies SE |
| Enagas Transporte S.A.U. | MISC BHD | Tsakos Energy Navigation Ltd |
| Eneos Corporation | Mitsubishi Corporation | Uniper Global Commodities SE |
| Energy Transfer Partners | Mitsui & Co Plant Systems, Ltd | V. Ships |
| Enterprise Products Partners L.P. | Mitsui OSK Lines Ltd | Wilhelmsen Ship Management SDN BHD |
| Etki Liman Isletmeleru Dogalgz Ithalat | Naftomar Shipping & Trading Co | Woodside Energy Ltd |
| VE Ticaret A.S. | National Gas Shipping Company Ltd | YPF S.A. |
| Excelerate Energy LP | National Grid Grain LNG | |
| Exmar N.V. | Nigeria LNG Limited | |
| | Northern Marine Mangement Ltd | |
| | NYK Line (Nippon Yusen Kaisha) | |
| | OLT Offshore LNG Toscana S.P.A | |
| | Oman LNG LLC | |

Associate Members (as of 31 December 2022)

| | | |
|--|--|--|
| ABS | Indian Register of Shipping | Smit Lamnalco |
| Babcock International Group | Korean Register | Svitzer A/S |
| Boluda Towage Spain, S.L. | Kotug International | TotalEnergies EP Mozambique Area 1, Limitada |
| Bureau Veritas Marine & Offshore | Kuwait Integrated Petroleum Industries Company | VENTURE GLOBAL LNG, INC |
| Celsius Tech Limited | Lloyd's Register | Vitol Services Ltd |
| China Classification Society | LNG Canada Development Inc. | Warsash Maritime Academy (Solent University) |
| China Energy Ship Management Co., Ltd. | Maritime Safety Queensland | Western Concessions Private Limited |
| ClassNK | Milford Haven Port Authority | Western LNG LLC |
| Combined Marine Terminal Operations Worldwide N.V. | Moran Towing Corporation | Wison (Nantong) Heavy Industry Co., Ltd |
| Commonwealth LNG | NextDecade LLC | Woodfibre LNG Limited |
| DNV AS | Polish Oil and Gas Company | |
| Ecolog Ltd | Port of Rotterdam Authority | |
| ExxonMobil PNG Limited | Purus Marine Tech Pte Ltd. | |
| Fratelli Neri S.P.A | Rimorchiatori Riuniti Spezzini - Imprese | |
| Gastrade S.A. | Marittime E Salvataggi S.R.L. | |
| GTT Training Ltd | RINA Services S.P.A. | |
| Guandong Dapeng LNG Co Ltd | SAAM S.A. | |
| Hazira Port Private Limited | SEFE Marketing & Trading Singapore Pte Limited | |
| Hong Kong LNG Terminal Limited | Signet Maritime Corporation | |
| Hongkong Salvage & Towage | Single Buoy Moorings Inc | |

SIGTTO Members' Declared Assets (as of 31 December 2022)



Benefits of Membership

New members joining the Society are able to gain immediate access to a vast body of expertise, exclusive information and opportunities to network. They are also able to influence the industry by participating in SIGTTO activities and producing best practices and guidelines.

In addition to the credibility in the industry that membership brings, SIGTTO members derive the following benefits:

- Access to information that is exclusive to members, such as casualty and industry statistics.
- 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.
- Access to the comprehensive technical library maintained in the London Office.
- Submitting proposals for projects and studies to the General Purposes Committee and Environmental Committee.
- Participating in discussion forums with other members on topics of particular and mutual interest.
- Regular updates on matters affecting the industry such as legislation, IMO, technical or operational developments.
- Free access to the LNG Web Info portal for updated LNG information as required to conduct compatibility studies. This information is restricted to members of SIGTTO and GIIGNL only.

Member Eligibility

To become a full member of SIGTTO it is necessary for a company to have equity interest in, or to operate, a gas tanker or terminal.

Associate membership is available to applicants as above, who have entered into a contract to build a gas tanker or a terminal.

Directors may also admit to associate membership the following organisations:

- Harbour authorities
- Tug vessel providers for liquefied gas terminals
- Classification societies
- Training providers for liquefied gas vessel sea staff and/or terminal personnel

Associate members have all the rights of a full member except for voting rights at the Annual General Meeting.



BSM MTC Cyprus LNG Simulator Training

Board of Directors



SIGTTO's Board of Directors, November 2022

SIGTTO Directors (as of 31 December 2022)

| | |
|--------------------------------|--|
| Lloyd Bland | Chevron Shipping [President] |
| Rahul Kulkarni | BP Shipping Limited [Vice President West] |
| Tetsuya Watabe | Jera Co., Incorporated [Vice President East] |
| David Furnival | Bernhard Schulte Shipmanagement |
| Riju Cherian | BW Gas AS |
| Roberto Vara | Freeport LNG Development, L.P. |
| James D Sagar | ExxonMobil |
| Øivin Iversen | Hoegh LNG |
| Paul Oliver | International Gas Transportation Co. Ltd. |
| Andreas Spertos | Maran Gas Maritime Inc |
| Raja Sager Muniandy | MISC BHD |
| Kenta Matsuzaka | Mitsui Osk Lines Ltd |
| George Paul Perantzakis | Naftomar |
| Hironobu Watanabe | NYK Line (Nippon Yusen Kaisha) |
| Abdullah Al Sulaiti | Qatar Gas Transport Company Ltd (Nakilat) |
| Chris McDade | Seapeak Maritime (Canada) Inc |
| Carl Henriksen | Shell |
| Nobushige Goto | Osaka Gas Co Ltd |
| Pierre Decarpigny | TotalEnergies SE |
| Edwin Mortimer | Conyers Dill & Pearman [Secretary] |

Secretariat Staff



Ian Revell
CEO



Cherian Oommen
Senior Technical Adviser



Robert Farmer
Principal Technical
Adviser



Ian Harrison
Regulatory Affairs
Adviser



Adrian Ruiz
Technical Adviser



Yunzhe He
Technical Adviser



Susan Humphrey
Membership Manager



Lindsey Briscoe
Finance Manager



Laura Else
Technical Publishing
Manager



Mariah Abshire
Technical Publishing
Assistant



Erin Rydings
Business Support

SIGTTO at the IMO

SIGTTO's main areas of focus at the International Maritime Organization (IMO) in 2022 were the revision of the IGC Code and safe decarbonisation.

SIGTTO demonstrated commitment to these aims by attending 10 IMO meetings and submitting six papers.

IGC Code

In May 2022, the IMO Maritime Safety Committee (MSC) agreed a new output to review the IGC Code. This was proposed by SIGTTO, Marshall Islands and IACS.

The review was considered in detail at the Sub-committee on Carriage of Cargoes and Containers (CCC 8) in September 2022. SIGTTO submitted and co-sponsored several documents proposing changes.

Unified Interpretations (UIs)

IACS and SIGTTO submitted a document proposing to incorporate 27 previously agreed and published UIs. The majority were agreed, with several being referred to a correspondence group for further consideration.

Filling limits

Chapter 15 on filling limits is being considered during the review of the IGC Code. Recognising that further information was needed, SIGTTO volunteered to develop a paper exploring the issues.

ESD requirements

Following the publication of SIGTTO's *ESD Systems* in 2021, SIGTTO proposed to amend elements of the IGC Code relating to emergency shutdown (ESD) systems.

The proposals included highlighting the need for safety systems to be independent from gauging systems, the addition of a cargo liquid sensor in the vent mast, and the revision of the cause-and-

effect table. The proposal will be considered by a correspondence group.

CO₂ toxicity

As part of work on the carriage of carbon dioxide (CO₂), SIGTTO submitted a proposal to amend the CO₂ triple point and CO₂ classification in the IGC Code.

The Code currently classifies CO₂ as an asphyxiant in Chapter 19. As CO₂ is widely classified as toxic in national codes, SIGTTO proposed to re-classify CO₂ as both an asphyxiant and toxic. The paper was forwarded to a correspondence group.



SIGTTO attended CCC 8 in September 2022, image by the IMO

Decarbonisation

SIGTTO is closely following the revision of the IMO's Greenhouse Gas (GHG) Strategy and attended the IMO Marine Environment Protection Committee (MEPC) meetings in June and December 2022.

In support of the IMO's efforts, the SIGTTO Environmental Committee is considering the IMO agenda, including the review of short-term measures, preparing for the development of mid-term measures, and developing recommendations for the reduction of methane and CO₂ emissions.

General Purposes Committee



Giovanni Giorgi
GPC Chair

GPC Chair Report

I am honoured to have been elected in 2022 as GPC Chair and proud to bring my support to the Society with two main targets:

1. **SAFETY:** putting safety at the heart of SIGTTO's mission, in particular improving and stressing the importance of information/lessons learnt exchange between members, fundamental for the protection of the industry.
2. **CARBON FOOTPRINT:** sharing know-how about new technologies to reduce the carbon footprint of the LNG/liquefied gases industry, in particular the shipping and terminal industry; this in support of the Environmental Committee Chair.

I am proud to have been part of SIGTTO since 2008, I truly believe that most of my know-how in the liquefied gas industry comes thanks to the information I have collected in this organisation. For this let me thank: the previous General Managers Bill Wayne and Andrew Clifton, the previous technical advisers Roger Roue, Marc Hopkins, Rick Boudiette, Thierry Descamps and the latest two GPC Chairs Mark Hodgson and John Boreman.

I would like to take the opportunity to make my congratulations to the new CEO Ian Revell for the new important appointment, and finally the current SIGTTO organisation: SIGTTO Secretariat, Vice-Chair Eleni Lazaratou, and Environmental Committee Chair John Boreman.

SIGTTO in the last years has produced numerous guidelines and documents responding to various requests from the industry and its members. I hope

the GPC and Secretariat will be able to quickly close most of the guidelines under preparation in order to focus the entire organisation on the new challenges and requests, in particular with regard to safe decarbonisation of the liquefied gas industry.

As a final point that I like to remember, the philosophy of the Society is best described in the words of our founding President, Barry Hunsaker of El Paso Natural Gas, 40 years ago in 1979:

"We will best achieve our goals by sharing with each other our non-proprietary technical and safety information and operating experiences through open and frank discussion. Only in this way will each of us benefit from the experience and knowledge gained by all of us and thus maximise the safety of our operations. Remember, the industry will be judged by the record of its least safe operator. Let's help ourselves by helping that operator".

With that in mind, I hope that newcomers in the liquefied gas industry and in particular developers of new onshore and offshore terminals and gas tankers will join SIGTTO in 2023.

I am truly convinced that SIGTTO, thanks to its history and membership know-how, has the capacity to be the leading organisation for the gas industry, not only for the safety aspects, but also for the deep decarbonisation process that all our companies are called to achieve. I look forward to meeting with you at the next SIGTTO events.

GPC Meetings

GPC 84, Athens

In 2022, SIGTTO returned to in-person Committee meetings after two years of virtual sessions. The GPC met for its 84th session in Athens on 29 March 2022.

During the meeting, the Committee received updates on current working groups. Two working groups had finished their task and the Committee approved the new publications, titled

Measurement and Reporting of CO₂ Emissions from Gas Carriers and Detecting and Reporting of Fugitive Methane Emissions from LNG Carriers.

The terms of reference (TOR) for the highly anticipated CO₂ Shipping Operations working group were formally approved and the group was given the green light to begin work.



General Purposes Committee, March 2022

GPC 85, London

The GPC met for its 85th session on 4th October 2022 in London.

At the meeting the GPC elected new leadership, with Giovanni Giorgi of OLT Offshore LNG Toscana appointed as GPC Chair and Eleni Lazaratou of Maran Gas Maritime Inc. appointed as Vice-Chair. Giovanni and Eleni will serve a three-year term in their roles.

Commenting on the new appointments, Ian Revell said, "I would like to welcome Giovanni and Eleni to their new roles leading the General Purposes Committee. We look forward to a strong co-operation in the coming years which will drive SIGTTO's policies in the Society's core activities."

During the meeting, the GPC provided feedback on two projects that had reached concept draft



Giovanni Giorgi was appointed as GPC Chair

stage, titled *Guidance for Gas Trials on LNG Carriers and Recommendations for Valves on Liquefied Gas Carriers.*

The GPC also approved the terms of reference for a new project to revise *LNG Emergency Release Systems (2017)*, a SIGTTO publication, to bring it up to date with current best practice.

GPC Working Groups

This section provides updates on the progress of the currently active GPC working groups.

Gas Trials for LNG Carriers

This working group, chaired by Rose Brooks of BP, was set up to revise *Guide for Planning Gas Trials for LNG Vessels* (2008).

Gas trials are carried out on new gas carriers to check that the cargo system is working properly. The working group is providing updated guidance to assist with planning a gas trial. This includes considerations for minimising the impact of greenhouse gas (GHG) emissions.

In 2022, this project reached concept draft stage and is set to be published in 2023.

Valves on Liquefied Gas Carriers

This document combines and revises *The Selection and Testing of Valves for LNG Applications* (2008) and *The Selection and Testing of Valves for LPG Applications* (2012).

Chaired by John Taylor of Shell, the working group is providing guidance on the selection, design and maintenance of valves on liquefied gas carriers. The document is expected to be useful for valve manufacturers, shipyards and ship owners.

This project reached concept draft stage in 2022 and is set to be published in 2023.

Design and Operation of Liquefied Gas Terminals

Chaired by Guy Nicholls of Cheniere, the group is working to combine and revise *Site Selection and Design for LNG Ports and Jetties* (1997) and *LNG Operations in Port Areas – Essential Best Practices for the Industry* (2003).

The document provides guidance on the site selection and design of liquefied gas terminals and operations during ship transit and at berth. The document highlights ways that the environmental impact of terminal design and operations can be reduced, including ways to reduce GHG emissions.

The working group met three times in 2022 and continues to make good progress on the document. They aim to submit a final draft in autumn 2023 and publish later in the year.

Jetty Maintenance and Inspection Guide

This joint working group with Oil Companies International Marine Forum (OCIMF) was set up to revise *Jetty Maintenance and Inspection Guide* (2008).

The project is nearing completion and the final draft was reviewed at GPC 85. Publication of the guide is expected in 2023.



Recommendations for Valves working group, November 2022

Use of LNG, LPG and Ammonia as Fuels

In 2022, this working group revised its TOR to include work on the International Gas Carrier (IGC) Code, the Energy Efficiency Design Index (EEDI), the Energy Efficiency Existing Ship Index (EEXI) and lessons learnt from incidents.

The working group met twice over the year and made good progress on addressing the safety, environmental and operational issues associated with gas carrier propulsion systems. They plan to reach final approval and publication in late 2023.

Reliquefaction Systems on Gas Carriers

This working group also revised its TOR to include work on the IGC Code, EEDI, EEXI and lessons learnt from incidents. All topics included in this draft will be used to align future revisions to the appropriate IGC Code chapters.

The working group met twice in 2022 and made good progress on addressing the safety, environmental and operational issues associated with gas carrier reliquefaction systems. They plan to reach final approval and publication in late 2023.

CO₂ Shipping Operations

This working group was established and met three times in 2022. The interest and importance of this topic are shown by its 19 members, making it the largest SIGTTO working group. All three meetings were well attended, and the working group has made good progress in developing the first draft.

Chaired by Ajay Edakkara of Shell, this working group is developing guidance on the transportation of liquefied carbon dioxide (CO₂). The document identifies the hazards associated with liquid CO₂ transportation and provides recommendations to support safe and environmentally responsible transportation.

The working group aims to have a concept draft ready for review in October 2023.

Gas Carrier Salvage

This working group, chaired by Ian Wolfarth of Chevron, met twice in 2022. They are working to provide guidance for potential salvage situations, with a focus on prevention and emergency preparedness.

The working group aims to submit a concept draft in late 2023.



CO₂ Shipping Operations working group, September 2022

Environmental Committee



John Boreman
EC Chair

EC Chair Report

SIGTTO supports the goals in the International Maritime Organization's (IMO's) Greenhouse Gas (GHG) Strategy and the Environmental Committee is tasked with developing and deploying solutions to meet these challenges. SIGTTO's full Environmental Policy can be viewed on the SIGTTO website.

Recognising the importance of the energy transition to SIGTTO members, this year the SIGTTO Board reconstituted the Environmental Committee from a sub-committee of the GPC to a full stand-alone committee.

The Environmental Sub-committee held its last meeting in Athens in March and handed over their work to the new Environmental Committee. The Environmental Committee met for the first time in October 2022 and I look forward to the next three years as Chair.

The Environmental Committee will support the IMO to develop and adopt measures to successfully achieve the goals set in the IMO's GHG Strategy. It will also engage with the IMO and other industry bodies to address any emerging technical and safety risks arising from these measures.

The Environmental Committee maintains an overview of the global environmental landscape related to liquefied gas shipping and terminals to identify priorities for consideration. It will proactively develop best operating practices and recommendations relating to environmental protection and contribute to the development of

industry codes and standards.

The Environmental Committee and its predecessor have already developed recommendations on the *Measurement and Reporting of CO₂ Emissions from Gas Carriers* and the *Detection and Reporting of Fugitive Methane Emissions from LNG Carriers*, published in 2022.

This work continues with working groups developing recommendations on the Reduction of CO₂ Emissions from Gas Carriers and the Reduction of Methane Emissions from LNG Carriers. These working groups will be submitting initial drafts to the Environmental Committee in October 2023.

SIGTTO has a long-standing reputation for its work underpinning the safety of liquefied gas transportation and handling. The Environmental Committee will build on these solid foundations to enable the IMO GHG goals to be realised. It will support the wider energy transition through the safe and sustainable transportation of liquefied gases.

EC 01, London (continued on Page 16)

The Environmental Committee's first meeting was held alongside GPC 85 in London on 4th October.

John Boreman of BP Shipping was appointed as the Environmental Committee Chair. John will serve a three-year term in this role.

► Updates were given on the progress of the EC working groups on the Reduction of Gas Carrier CO₂ Emissions and the Reduction of LNGC Methane Emissions.

The Committee spent time discussing the strategy and opportunities of the EC, including SIGTTO's work in supporting the International Maritime Organization's (IMO's) GHG Strategy.



Reduction of Methane Emissions working group, November 2022

EC Working Groups

Reduction of Methane Emissions from LNG Carriers

This working group began at the start of 2022 and met three times during the year. The group is developing the first draft and aims to submit a concept draft to the EC in Autumn 2023.

Chaired by Ajay Edakkara of Shell, they are developing a document that outlines the main sources of methane emissions and provides guidance for reducing these emissions for LNG carrier design and operations.

This project builds on the guidance in the new SIGTTO publication, *Detection and Reporting of Fugitive Methane Emissions from LNG Carriers*. Methane is a GHG, and these documents are part of a series that supports the IMO's goals on the reduction of GHG emissions.

Reduction of CO₂ Emissions from Gas Carriers

Chaired by Leonidas Koulouridis of Shell, this working group also began in 2022 and is part of SIGTTO's work to support the IMO's goals on the reduction of GHG emissions.

Building on the guidance in the new SIGTTO publication, *Measurement and Reporting of CO₂ Emissions from Gas Carriers*, this project will provide high-level guidance to assist the gas shipping industry in its efforts to reduce carbon dioxide (CO₂) emissions. This covers the reduction of gas carrier CO₂ emissions during design and operations.

The working group made good progress in developing the first draft and aims to submit a concept draft to the EC in Autumn 2023.



Shell

Regional Panels

Athens, March 2022

SIGTTO held its 65th Panel Meeting in Athens on 30th to 31st March 2022. Hosted by Maran Gas Maritime and chaired by Eleni Lazaratou, it was the first face-to-face Panel in four years.

A total of 24 speakers presented and 185 registrants from 83 companies signed up for the event.

The current drive to reduce ship greenhouse gas emissions was a strong theme, with seven presentations on the subject. These included two papers on the compliance challenges facing LNG carriers, one by Spyros Gertsos of Maran Gas Maritime and the other by Carlos Guerrero and Vassilios Dimoulas of Bureau Veritas.

George Dimopoulos and Martin Cartwright of DNV presented on the issue of carbon intensity indicators for LNG carriers past 2030. On the same theme Niels Clausen of MAN Energy Solutions looked at the efforts being made by his company to decarbonise propulsion systems.

The day ended with a question-and-answer discussion panel with the speakers.

London, October 2022

SIGTTO held its first two Regional Panel meetings in Autumn 2022. This new style of panel meeting covers *Safety and Innovation* topics in the morning, followed by an afternoon *Environment* session.

The first Regional Panel meeting took place in London on 5th October 2022. The event was chaired by Giovanni Giorgi of OLT Offshore LNG Toscana, the new GPC Chair.

In the *Safety and Innovation* session, Magnus Gillberg and Fredrik Jonasson of Consilium Marine & Safety AB presented on gas detection for alternative fuels, including methanol, ammonia and hydrogen. Raphael Poichot of Technip also presented on the design of liquid CO₂ marine loading arms.

Environmental topics covered in the afternoon session focused on addressing greenhouse gas (GHG) emissions. Paul Balcombe of Queen Mary University of London presented on measuring and reducing methane emissions from LNG carriers. Another presentation that focused on measurement was given by Krisian Hovet of



Athens Panel Meeting, March 2022

Tunable AS on online fuel gas and emission gas measurements.

Roel Hoenders of the International Maritime Organization (IMO) then provided an overview of IMO regulatory work on reducing GHG emissions from international shipping.

Both sessions were followed by panel discussions with the speakers. There was lively audience participation and in-depth discussion of these topics.



London Regional Panel, October 2022

Singapore, November 2022

The Singapore Regional Panel meeting was held on 17th November 2022 and was chaired by Hans Weverbergh of Exceleerate Energy.

The morning session focused on innovative technologies. This included a presentation on a liquefied hydrogen loading arm by Frederic Pelletier of TB Global Technologies Ltd. This was followed by a presentation by Yoshiyuki Moriyama of Fukui Seisakusho Co., Ltd on safety valve development for liquefied hydrogen and liquefied CO₂ carriers.

The final presentation of the morning was by Tien Loong Wong of NUS Education, who provided an introduction to the Technology Centre for Offshore & Marine Singapore (TCOMS) and its research and development capabilities and facilities.

In the afternoon *Environment* session, presentations focused on the implications of decarbonisation. Jayendu Krishna of Drewry presented on the latest developments in the gas market and Ashish Anilan of Bureau Veritas presented on maritime decarbonisation and considerations for gas carriers.

This was followed by a presentation by Douglas Raitt of Lloyds Register on the longevity of LNG carriers operating in the age of GHG emission reduction, with an assessment of the challenges and solutions. A presentation was then given by Gustad Hormazdi of DNV on the energy transition outlook and maritime forecast.

Both the morning and afternoon sessions were followed by interactive panel discussions with the speakers.



Singapore Regional Panel, November 2022

CO₂ Transportation

Issues of CO₂ Transportation

Carbon capture, utilisation and storage is a key aspect of global decarbonisation, making liquid carbon dioxide (CO₂) transportation an interesting topic.

The most practical way to transport liquid CO₂ is by pipeline or ship. CO₂ shipping has existed for 30 years, with the main demand for CO₂ coming from the food and beverage industries. In these industries, impurities in the liquid CO₂ stream are very limited.

The 2016 edition of the IGC Code introduced liquid CO₂ into Chapter 19. This gives useful guidance for safe operations with CO₂, but further clarification to this guidance may be helpful. For example, the main hazard of CO₂ is its toxicity, rather than its properties as an asphyxiant. In addition, different impurities could introduce more risks, including corrosion and thermodynamic issues.

CO₂ has a wide range of transporting pressures and temperatures, from -55°C to ambient temperature, and around 20 impurities may be present in the liquid CO₂ stream. This wide range of pressures and temperatures can cause the reaction between impurities to become more complicated and unpredictable. Studies and experiments are being carried out to assess this, but time will be needed for real-world verification.

Another issue for CO₂ transportation is pressure control. CO₂ has a high triple point pressure (approximately 5 bar), which causes CO₂ to be either a solid or gas under ambient pressure. For LNG and LPG transportation, it is not an issue as the triple point of these products is lower than ambient pressure.

For liquid CO₂ transportation, measures need to be taken to prevent loss of pressure in the

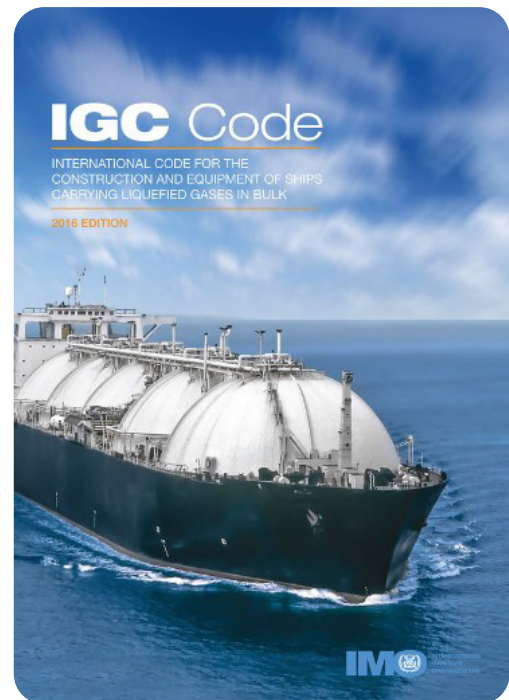
system and avoid dry ice formation. System design should consider the possibility of incident escalation resulting from dry ice.

SIGTTO is considering the issues of CO₂ transportation as it assists in the revision of the IGC Code.

SIGTTO Working Group

SIGTTO helps the industry by providing best practice guidance, but for urgent liquid CO₂ transportation, SIGTTO needs to make sure the risks of CO₂ are not being underestimated, with very limited experience.

SIGTTO established the CO₂ Shipping working group in 2022. Chaired by Ajay Edakkara of Shell, the group is developing guidance to support safe and environmentally responsible transportation of liquid CO₂.



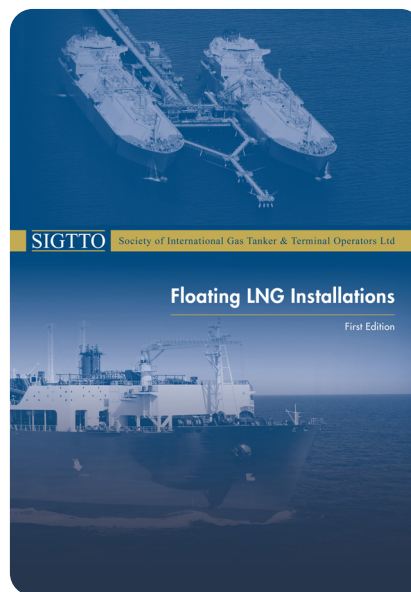
Details of CO₂ carriage are being clarified in the revision of the IGC Code

Floating LNG Installations

2022 has proven to be a busy year for floating LNG installations, with several floating storage and regasification units (FSRUs) and an LNG floating production, storage and offloading (LNG FPSO) project coming online. These potential fast-track solutions continue to be a viable alternative to conventional land-based terminals depending on the required project specifics.

With the first commercial ship-to-ship (STS) transfer of LNG in 2007 and the first operational FSRU vessel in 2008, this sector of the LNG industry continues to grow with 45 FSRUs and six LNG FPSOs active at year-end. 2023 looks to continue in this manner with more projects being considered and previously ordered assets commencing operation.

SIGTTO, via its members, saw the opportunity to provide the industry with guidance on the development and operation of floating storage units (FSUs), FSRUs and LNG FPSOs and published *Floating LNG Installations* in 2021. Subsequently from that work, the revision of *LNG Shipping Suggested Competency Standards (2021)* included an entirely new section dedicated to FSRU operations for officers



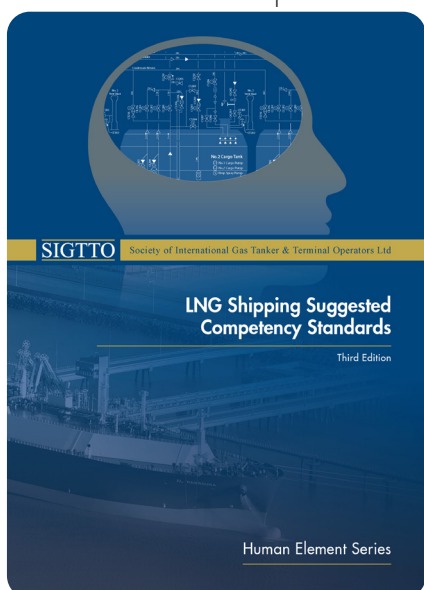
Floating LNG Installations (2021)

involved throughout LNG cargo operations and gas send-out cycles.

Both of these industry best practice publications are not only applicable to current floating LNG installation operators but are a wealth of information for project developers and new entries into this sector. With a key focus on safety and potential project considerations, these reference materials were produced to assist with increasing information clarity and decision quality associated with all phases of a floating LNG installation project.

In addition to our published industry guidance, several operators of these floating LNG installations sit on the General Purposes Committee (GPC) and provide relevant feedback on issues and lessons learnt from the thousands of STS transfers associated with these assets that have become industry standard. The GPC is currently chaired by Giovanni Giorgi who comes from an established FSRU operator.

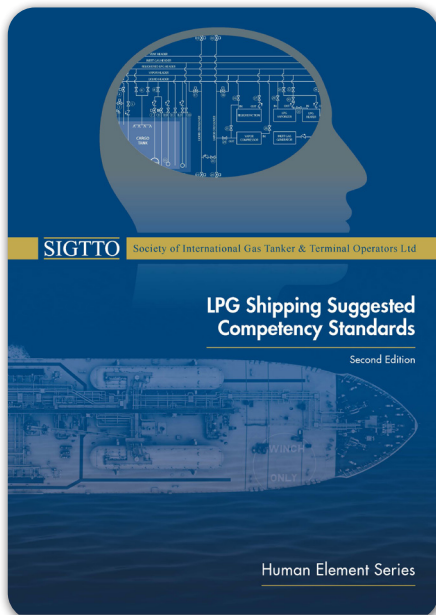
SIGTTO continues to be an information resource for this sector and looks forward to the continuing evolution of this technology and sharing information with our members and the wider industry.



LNG Shipping Suggested Competency Standards (2021)

New Publications

SIGTTO published five new publications in 2022. For information on how to download or purchase publications, visit our website: www.sigtto.org.



LPG Shipping Suggested Competency Standards

This document is written for organisations involved in training officers, including cargo engineers, for LPG cargo operations. It is suitable for individuals that are technically qualified and experienced in the subject of training and LPG operations.

This document updates and replaces the previous edition, *LPG Shipping Suggested Competency Standards* (2008). The update reflects changes in technology and lessons learnt from incidents since the previous edition was published. The growing use of LPG as a fuel by LPG carriers is a significant addition now covered by this edition.

Liquefied Gas Cargo Resource Management Course

Cargo resource management (CRM) enables safe cargo operations by using all available resources, including the crew, equipment and relevant information. This document provides recommendations for CRM training courses.

The training courses covered in this document are designed for officers and other shipboard personnel engaged in cargo operations. This document is expected to provide useful guidance for organisations involved in CRM training in the liquefied gas industry.

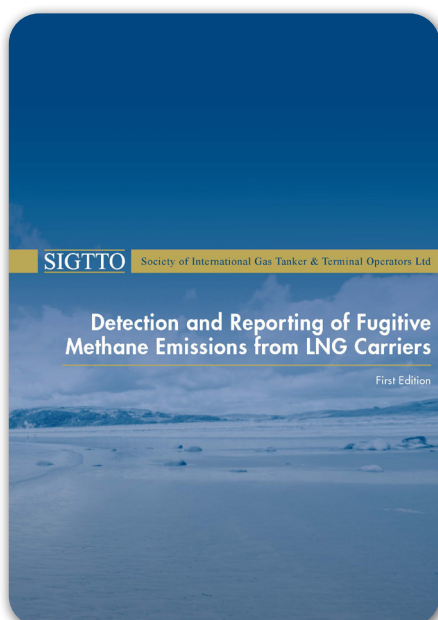
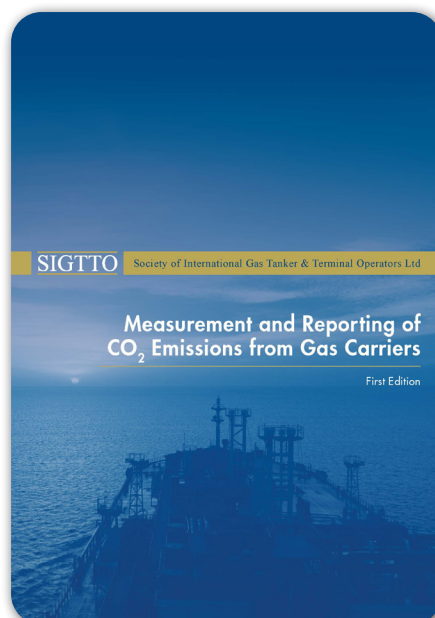


Measurement and Reporting of CO₂ Emissions from Gas Carriers

This document provides guidance to assist the gas shipping industry in its efforts to reduce carbon dioxide (CO₂) emissions. It provides guidance on the standardised measurement and reporting of CO₂ emissions.

This document identifies typical sources of CO₂ emissions from gas carriers and describes the methodologies for measuring CO₂ emissions.

The reporting standards set by the IMO and European Union for CO₂ emissions are then explained, covering both technical and operational efficiency.



Detection and Reporting of Fugitive Methane Emissions from LNG Carriers

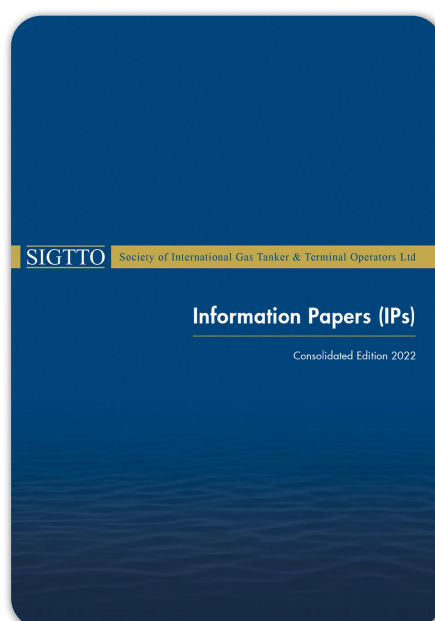
This is the first document in a series to assist the gas shipping industry in its efforts to reduce methane emissions from LNG carriers. As a first step, this document provides guidance on the detection and reporting of fugitive methane emissions.

This document recommends a structured system to identify, detect, measure and quantify fugitive emissions of methane from LNG carriers. This may also support a leak detection and repair (LDAR) system to reduce emissions through maintenance and design improvements.

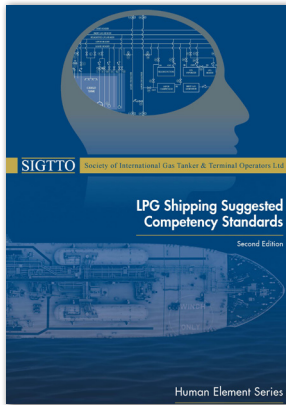
SIGTTO Information Papers (Consolidated Edition 2022)

This publication contains all the SIGTTO Information Papers that are in force for 2022, for the guidance of industry members.

It has been updated to include: *ESD Systems, Guidance on Gas Carrier and Terminal Gangway Interface, Recommendations for Management of Cargo Alarm Systems, Recommendations for Designing Cargo Control Rooms, and Recommendations for Cargo Control Room HMI.*



SIGTTO Publications List



Liquefied Gas Cargo Resource Management Course (2022) Free

LPG Shipping Suggested Competency Standards (2022) £175

Measuring and Reporting of Gas Carriers CO₂ Emissions (2022) Free

Detection and Reporting of Fugitive Methane Emissions from LNG Carriers (2022) Free

SIGTTO Information Papers (Consolidated Edition 2022) £195

ESD Systems (2021) Free

LNG Shipping Suggested Competency Standards (2021) £175

Recommendations for Cargo Control Room HMI (2021) Free

Floating LNG Installations (2021) £225

Guidance on Gas Carrier and Terminal Gangway Interface (2021) Free

Recommendations for Designing Cargo Control Rooms (2020) Free

Recommendations for Relief Valves on Gas Carriers (2020) £175

Recommendations for Management of Cargo Alarm Systems (2019) Free

Ship/Shore Interface for LPG/Chemical Gas Carriers and Terminals (2018) £175

Guidelines for the Alleviation of Excessive Surge Pressures on ESD for Liquefied Gas Transfer Systems (2018) £175

Recommendations for Liquefied Gas Carrier Manifolds (2018) £175

LNG Marine Loading Arms and Manifold Draining, Purging and Disconnection Procedure (2017) Free

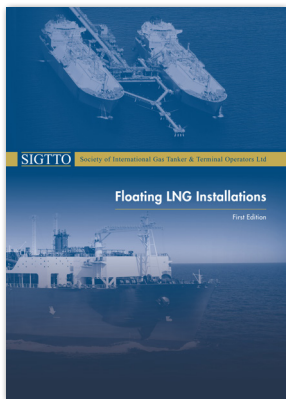
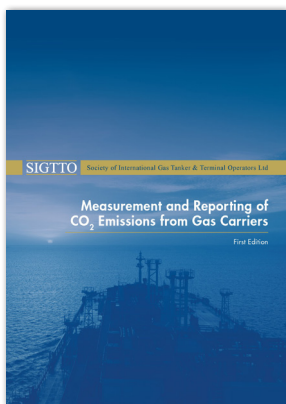
LNG Emergency Release Systems (2017) £125

Liquefied Gas Handling Principles on Ships and in Terminals (LGHP4) (2016) £275

SIGTTO LNG and LPG Experience Matrix Guidelines for Use (2016) Free

Support Craft at Liquefied Gas Facilities. Principles of Emergency Response and Protection - Offshore (2016) £125

Support Craft at Liquefied Gas Facilities. Principles of Emergency Response and Protection - Onshore (2015) £125



Suggested Quality Standards for LNG Training Providers (2014)

Free

A Justification into the Use of Insulation Flanges (and Electrically Discontinuous Hoses) at the Ship/Shore and Ship/Ship Interface (2014)

Free

Ship to Ship Transfer Guide for Petroleum, Chemicals and Liquefied Gases (2013)

£275

Liquefied Gas Carriers: Your Personal Safety Guide (2012)

£25

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

£25

Guidance for the Prevention of Rollover in LNG Ships (2012)

Free

The Selection and Testing of Valves for LPG Applications (2012)

Free

Thermowells in LNG Carrier Liquid Lines (2011)

Free

LNG Steamship Suggested Competency Standards for Engineers (2010)

£125

Liquefied Petroleum Gas Sampling Procedures (2010)

£25

Simulation Information Paper (2010)

Free

Report on the Effects of Fire on LNG Carrier Containment Systems (2009)

Free

Jetty Maintenance and Inspection Guide (2008)

£175

Hydrates in LPG Cargoes (2008)

£75

The Selection and Testing of Valves for LNG Applications (2008)

Free

Guide for Planning Gas Trials for LNG Vessels (2008)

Free

Gas Concentrations in the Insulation Spaces of Membrane LNG Carriers (2007)

Free

Liquefied Gas Fire Hazard Management (2004)

£175

LNG Operations in Port Areas (2003)

£75

A Guide to Contingency Planning for Marine Terminals Handling Liquefied Gases in Bulk (2001)

£40

Fire Prevention in the Cargo Containment Systems of Liquefied Gas Carriers in Shipyards (2001)

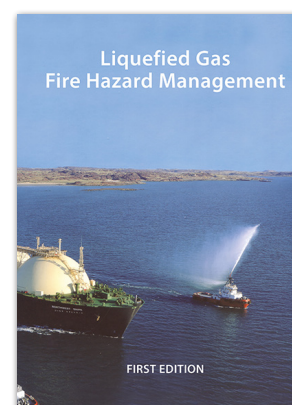
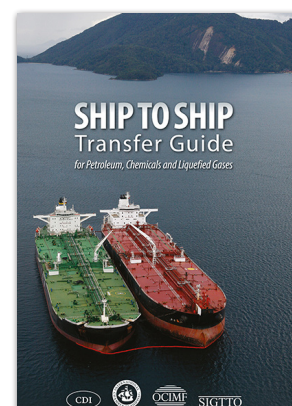
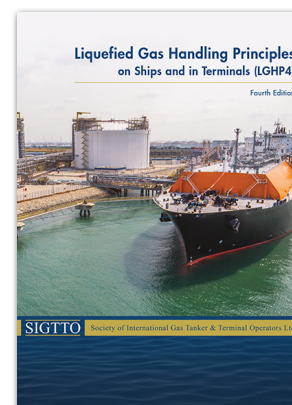
Free

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

£40

Site Selection and Design for LNG Ports and Jetties (1997)

£40



2022 Accounts

STATEMENT OF FINANCIAL POSITION AS AT 31 DECEMBER 2022

| | 2022 £ | <i>As restated</i> 2021 £ |
|--------------------------------|--------------------------------|---------------------------------|
| Assets | | |
| Non-current Assets | | |
| Property, plant and equipment | <u>788,847</u> | <u>982,587</u> |
| | 788,847 | 982,587 |
| Current Assets | | |
| Trade & other receivables | 320,991 | 314,092 |
| Cash & cash equivalents | <u>2,044,603</u> | <u>2,728,880</u> |
| | 2,365,594 | 3,042,972 |
| Total Assets | <u>3,154,441</u> | <u>4,025,559</u> |
| Liabilities | | |
| Non-current Liabilities | | |
| Lease liabilities | <u>756,080</u> | <u>867,377</u> |
| | 756,080 | 867,377 |
| Current Liabilities | | |
| Trade and other payables | 273,783 | 438,574 |
| Lease liabilities | <u>82,429</u> | <u>151,019</u> |
| | 356,212 | 589,593 |
| Total Liabilities | <u>1,112,292</u> | <u>1,456,970</u> |
| Net Assets | <u><u>2,042,149</u></u> | <u><u>2,568,589</u></u> |

Issued capital and reserves

| | | |
|---------------------|--------------------------------|--------------------------------|
| Share capital | 26,705 | 25,935 |
| Retain earnings | <u>2,015,444</u> | <u>2,542,654</u> |
| TOTAL EQUITY | <u><u>2,042,149</u></u> | <u><u>2,568,589</u></u> |


 The logo for SIGTTO, consisting of the word "SIGTTO" in a white, serif font, centered within a dark blue rectangular box. Two thin horizontal lines are positioned above and below the text.
 SIGTTO

The Society of International Gas
Tanker and Terminal Operators

5th Floor, 42 New Broad Street
London, EC2M 1JD

Tel: +44 20 7628 1124

E-mail: reception@sigtto.org

