



SIGTTO

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



SIGTTO

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MESSAGE FROM GENERAL MANAGER



Time to celebrate!

Andrew Clifton, the SIGTTO General Manager,

reports that the LNG industry has much to celebrate on the occasion of its 50th birthday

The Society has maintained steady forward progress with its many activities during an extremely busy year. The membership continues to grow and we engage with that membership on an ongoing basis. This year we have nine regional forums, including our first ever in South America, hosted by Gas Sayago in Montevideo. This is in addition to two gatherings of the General Purposes Committee (GPC), two Panel Meetings and two meetings of the SIGTTO Board.

Quite aside from the busy schedule, 2014 is a very special year for both LNG shipping and SIGTTO. October 2014 marks the 50th anniversary of commercial operations in the LNG industry. On 12 October 1964 the 27,400m³ *Methane Princess* arrived at Canvey Island on the River Thames to the east of London to discharge a cargo of LNG from Algeria. The landmark delivery was the first commercial LNG cargo to be carried by sea. This notable year also marks the 35th anniversary of SIGTTO.

SIGTTO's Livorno Panel Meeting in October will celebrate both of these occasions. We are also pleased to include *LNG Shipping at 50*, a special commemorative supplement, as an accompaniment to this edition of our newsletter. The publication contains many fascinating articles about the early days of our industry and provides a useful roundup of the latest technological advances which have swept across the LNG shipping and terminal sectors over the past decade. *LNG Shipping at 50* has been



There was an attentive audience for the Paris Panel Meeting in May

jointly produced with our good friends and colleagues at the Group of Liquefied Natural Gas Importers (GIIGNL). I hope you enjoy reading this unique publication and retain a copy as a keepsake for future reference.

Whilst researching an article on the history of SIGTTO for this publication, I took the opportunity to dust off several archived board meeting minutes from the formative days of the Society. The first technical issues that SIGTTO dealt with were as follows:

- Contingency planning
- Ship/shore linked emergency shutdown
- Safe havens
- Cargo strainers
- Training

It is interesting to note that most of these topics are still being discussed, to some degree or another, at SIGTTO GPC meetings in 2014!

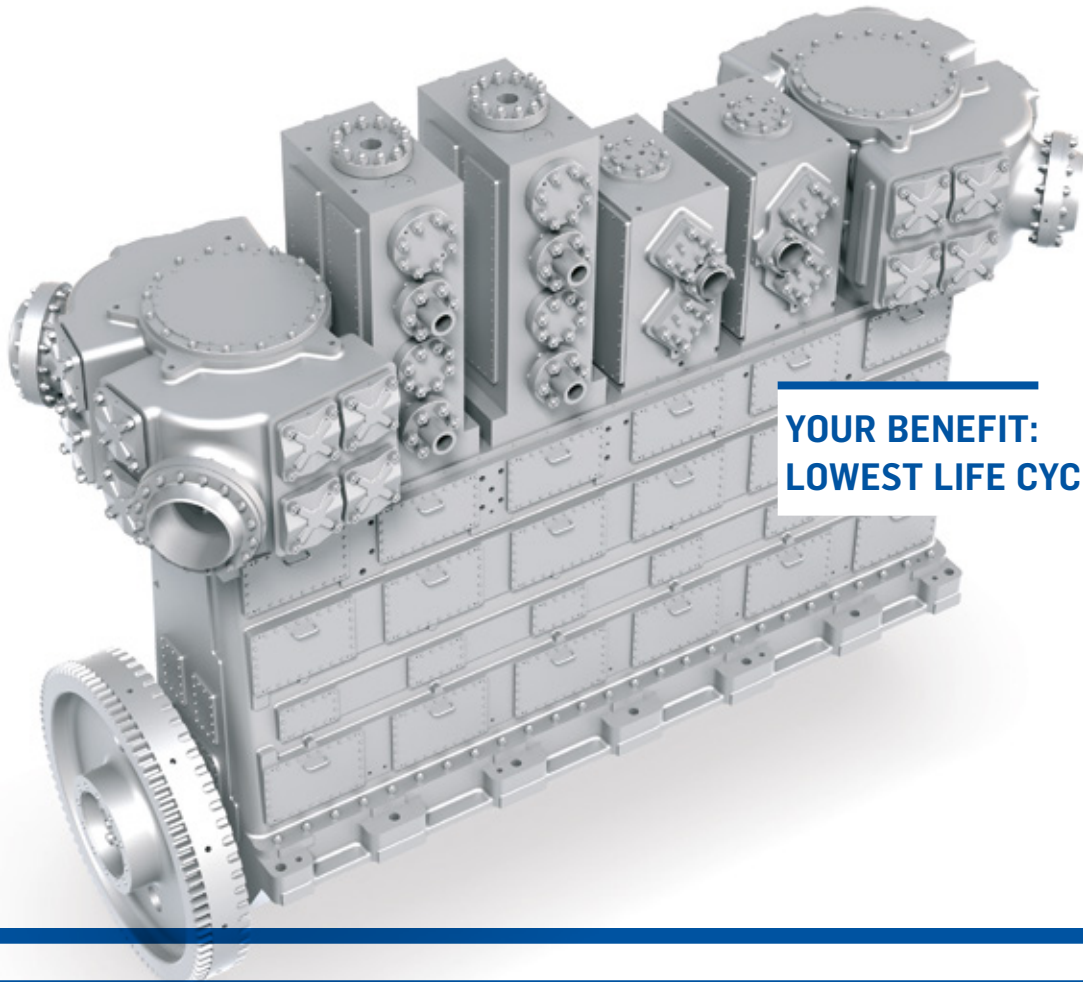
Another enjoyable part of carrying out research for the 50th anniversary publication and the Livorno Panel has been the opportunity to engage with several of the, now retired, pioneers of our industry. We have been very pleased to converse with Roger Ffooks, Robin Grey (the second SIGTTO general manager), Jim Whyte and Graham McGuire, all of whom contributed towards the development

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"I hope you enjoy reading our unique LNG Shipping at 50 publication and retain a copy as a keepsake for future reference."

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MESSAGE FROM GENERAL MANAGER



Total's Luc Gillet, the current SIGTTO president, welcomes delegates to the 59th Panel Meeting; Andrew Clifton stands in the background

...continued from page 1 >

of the liquefied gas shipping industry.

SIGTTO's 59th Panel Meeting, kindly hosted by Total, was held in Paris last May and was a great success. The president of the International Gas Union (IGU), Jérôme Ferrier, gave the keynote speech. Around 170 SIGTTO members attended the two-day event and a considerable amount of positive feedback was received from those attending. Gaz Transport & Technigaz (GTT) kindly hosted the technical visit which featured a well-organised tour of their laboratories and new training centre just outside Paris. Further details of the 59th Panel, including photos, can be found on page 7.

At our panel and regional meetings it is always fascinating to speak to the membership and understand their concerns and issues. A common theme is how busy each of our members are. While this is obviously a good point for their respective organisations, it does bring with it frequent complaints about the lack of suitable skills available to assist with the the additional activities and the resultant increased workload. The only practical answer to the current skills shortage the industry is facing is investment in training. Furthermore, the training focus should not be just on the ship staff. It is also necessary for our industry to have sufficient numbers of suitably skilled shore support staff as well as trainers of the appropriate quality.

In this respect I have been pleased to visit two new training centres in recent

“Technical staff are pushing ahead with a portfolio of new publications which should hit the shelves in the next two years”

weeks. One, as mentioned above, is the new facility at GTT's headquarters. The other is Teekay's upgraded training complex in Glasgow. I am also due to visit Chevron's new training centre in Glasgow shortly after the Livorno Panel Meeting. We are very pleased to see organisations recognising the need for investment in training and providing these facilities.

The SIGTTO Panama Canal publication, *Guidance for LNG carriers transiting the Panama Canal*, was published in June 2014 and has proved to be a popular addition to our list of titles, with good industry take-up.

A current topic being progressed by the SIGTTO directors is a strategic review of the Society going forward. This review is to ensure that the Society remains relevant and fit for purpose to meet the needs and expectations of the membership in the 21st century. It is hoped to finalise the review by the end of the year and no doubt the findings and any decisions made will play a key role in determining the future direction of the Society.

The SIGTTO Secretariat is also undergoing a process of change, with an emphasis being placed on enhanced efficiency and productivity. New internal procedures are being put in place and the technical staff are pushing ahead with a portfolio of new publications which should hit the shelves in the next two years. My Secretariat team continues to work hard to meet the demands of a small but busy office.

I would also like to take the opportunity to give a very warm welcome to the Secretariat to our newest technical adviser, Thierry Descamps. Thierry joins us on secondment from ConocoPhillips and further information on Thierry's background and career to date can be found on page 5.

UPCOMING MEETINGS 2014

MEETING	DATE	LOCATION
70th General Purposes Committee	7 Oct	Livorno, Italy
60th Panel Meeting	8-9 Oct	Livorno, Italy
Panel Technical Visit - OLT Toscana	10 Oct	Livorno, Italy
Pan American Regional Forum	12 Nov	Houston
Autumn Board Meeting & AGM	18 Nov	Oslo
Australian Regional Forum	11 Dec	Perth

UPCOMING MEETINGS 2015

MEETING	DATE	LOCATION
71st General Purposes Committee	14 Apr	Shenzhen, China (TBC)
61st Panel Meeting	15-16 Apr	Shenzhen, China (TBC)
Panel Technical Visit - Guangdong LNG	17 Apr	Shenzhen, China

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MEET THE PEOPLE AT SIGTTO

TECHNICAL ADVISER Thierry Descamps



Thierry Descamps has joined the SIGTTO Secretariat in London as a Technical Adviser, on secondment from ConocoPhillips (COP). Prior to this posting Thierry worked for 16 years at COP, in both downstream and

upstream roles and based in Brussels, Singapore and Moscow, respectively. Before that he was at sea for 10 years, serving on board product, LPG and LNG carriers for Ahlers Shipping and Exmar. During the last two of his seagoing years Thierry sailed on Exmar LNG carriers running between Arzew in Algeria and the Belgian port of Zeebrugge and was also involved with LNGC drydocking projects in Lisbon. Thierry holds a BS degree in maritime sciences and a merchant marine master's license from the Antwerp Nautical College.

Thierry Descamps joined COP in 1998, initially as sales engineer for the North Sea customer team in the Specialty Products Division and then as head of the business development group covering the Ukraine, Russia, Azerbaijan, Kazakhstan, Poland, Latvia, Belarus and Lithuania.

In 2000 he relocated to Singapore to develop Specialty Products sales in South East and Australasia. This was followed, in 2001, by a move to Russia where he started a COP Specialty Products sales and engineering operation in Moscow. Following a brief posting to Belgium, his

native country, Thierry returned to Russia in 2006 as COP Specialty Products country manager for Russia and Azerbaijan.

In 2012 Thierry transitioned to COP upstream operations and became the Caspian Oil & Gas transportation manager, focusing on all COP activities related to the transport of the oil, gas and sulphur output from the Kashagan field. He also served as COP representative on the board of the Baku-Tbilisi-Ceyhan (BTC) pipeline in Azerbaijan, a BP-operated joint venture in which COP has equity.

Over his career Thierry has developed a strong understanding of not only the issues related to the storage and transport of oil and gas but also pipeline transportation dynamics; economics and geopolitics in emerging and often challenging environments; customer relations; diplomatic skills; and small group interaction and psychology.

Thierry speaks Dutch, French, English and German and has a good understanding of Russian. His outside interests include modern history, international relations, tennis, skiing, art and architecture. He is married and has two daughters.

TAKE ME OUT TO THE BALLGAME!

Rick Boudiette, SIGTTO's technical advisor seconded from Chevron, is enjoying his time in London and getting to grips with English culture. Rick, a US national, recently attended an evening cricket match at the Oval in London in order to get to grips with the finer points of the game. Although there were very few "time outs" or "home runs", there was no shortage of maiden overs and ducks!



NOT STEPPING ON THE GAS

The England football team at their Rio training ground during the recent World Cup 2014 tournament, with an Exmar LNG carrier in the background keeping a watching brief. Very little boil-off gas was lost during England's short stay in Brazil!



PUBLICATIONS

Updated Principles

The Secretariat, with the support of a Steering Committee and various Society members, is embarked upon an update to the Society's flagship publication, *Liquefied Gas Handling Principles*.

The last revision was conducted over 15 years ago and there is a need to update the publication to reflect the significant technological advances that have been made in the industry over that period. These advances include developments in propulsion systems, reliquefaction systems, ships sizes, ship types and shipboard regasification. The targeted publication date for the revised edition of *Liquefied Gas Handling Principles* is mid-2015.



John Adams, Teekay Shipping (Glasgow) Ltd's managing director, "on the bridge" at the company's Glasgow training centre

Investing in skilled manpower

As Andrew Clifton points out in his General Manager's Message on page 1, the gas shipping industry is currently in the midst of a major growth phase and the only practical answer to the current skills shortage the industry is facing is investment in training. In this respect it is good to report on two recent major initiatives on the training front.

One of the companies making a strong commitment to the current fleet expansion is Teekay. Although the company only entered the LNG sector in 2004, it now owns or part owns over 45 LNG carriers, including newbuildings. Managed from Glasgow, this is the world's second largest independently controlled LNGC fleet. Teekay's ambitious newbuilding programme includes icebreaking LNG carriers to transport Russian LNG; LNG carriers powered by two-stroke, dual-fuel diesel engines to lift US exports; and a series of vessels building in China for charter to BG Group. The company anticipates placing further orders for new LNGCs in the years ahead.

To ensure a supply of skilled and properly trained seafarers and support staff for this expanding fleet, Teekay opened a new simulator training centre in Glasgow in May this year. Andrew Clifton had the opportunity to attend the official inauguration of the facility and to make a congratulatory presentation. Other luminaries present at the event were David Glendinning, president of Teekay Gas Services, John Adams, managing director of Teekay Shipping (Glasgow) Ltd and Commodore Davy Rolle

of the Bahamas Maritime Authority.

The new centre offers courses in ship handling, navigation, bridge teamwork, ship-to-ship transfers, cargo-handling operations and vessel behaviour in heavy traffic situations and harsh weather conditions. A full range of simulator facilities is available and their use constitutes a central feature of the training programmes on offer. Teekay expects to put several hundred trainees through the centre's navigation and cargo-handling courses annually.

The other recent notable training centre opening is that at the Gaz Transport & Technigaz (GTT) headquarters on the outskirts of Paris. Delegates to the 59th SIGTTO Panel Meeting in Paris in May this year had the opportunity to make a technical visit to GTT and to see the new centre.

Well known for its LNG membrane containment systems, GTT has over 50 years of industry experience and more than two-thirds of the ships in the current LNGC

fleet are fitted with one of its membrane tank systems. The company decided to establish GTT Training Ltd as a new affiliate focused on the provision of specialised training courses and software tools for those involved in the shipping, storage and handling of LNG.

The underlying aim of the initiative is to improve participants' knowledge and understanding of the relevant processes and procedures. By helping trainees to appreciate why a procedure is carried out in a particular way, as well as how, their performance and effectiveness are enhanced and the risk of error is reduced.

The GTT Training offering will complement and support existing training providers by focusing on courses that require either a higher degree of technical knowledge or courses not available in other establishments. The new company also offers training for instructors in institutions who wish to expand their LNG training capability.

The new company is already providing courses in LNG cargo operations, at SIGTTO management level and approved by DNV GL, and GTT containment system technologies. The portfolio is being expanded to include courses associated with the use of LNG as marine fuel and the commercial aspects of the LNG trades.

The LNG cargo operations package is a five-day course using a specialised liquid gas handling simulator developed in-house. Delegates are exposed to a full drydock-to-drydock voyage cycle of cargo operations during the course of the tuition, together with lectures, discussions, guided self-study and assessments.

Courses are run either at the newly constructed training centre at the GTT premises or on-demand in various locations around the world. GTT Training also provides simulation and software tool development services that support both the training and research activities of the parent company and other sectors of the LNG industry.



The GTT courses aim to show trainees not only how things are done but also why



All the available places for the GTT technical visit were taken up

Springtime in Paris

Kindly hosted by Total, the 59th SIGTTO Panel Meeting took place in Paris on 14-15 May 2014. The Society's spring board meeting was held at the same venue on 13 May and, following that gathering, several directors stayed on to attend the Panel sessions. As well as the presentations, they and the Panel delegates were able to enjoy the Panel dinner on the evening of 14 May, at which a magician entertained diners between courses.

Jérôme Ferrier, president of the International Gas Union (IGU), delivered the keynote speech at the Panel Meeting.

Other presentations covered topics such as the Arc 7 ice class, icebreaking LNG carriers that will serve Yamal LNG; rollover in LNG shore storage tanks; the human factor in the safety equation; dual-fuel diesel-electric (DFDE) operations; a progress report on the Dunkirk LNG receiving terminal; floating LNG (FLNG) production vessels; LNG bunker loading systems; the salvage of the LPG carrier *Oberon*; LNG as a marine fuel; and the activities of the International Group of LNG Importers (GIIGNL).

On 16 May delegates had the opportunity to participate in a technical visit to the headquarters, laboratories and training facilities of Gaz Transport & Technigaz (GTT) on the outskirts of Paris. To better assimilate

the range of activities in which GTT is engaged in developing, marketing and supporting its world-famous membrane tank containment systems, attendees were split into six manageable size groups for visits to the following departments, in rotation:

- Laboratory visit
- Liquid motion tests
- Model presentation
- LNG as a fuel
- Tank testing and inspection
- LNG simulation training centre

GTT's LNG simulation training centre is described in a separate article on page 6.

The Society is grateful to the SIGTTO president Luc Gillet and his team at Total for hosting both the spring board and the 59th Panel meetings and also to Philippe Berterottiere of GTT and his colleagues for the stimulating technical visit they had organised for our members.

As the LNG supply chain continues to extend into new areas, GTT is engaged in complex research and development work to adapt its technologies for new applications. No matter how intricate the visitor questions spurred by the R&D work on view, GTT had experts on hand to explain the solutions they are developing in simple and straightforward terms.

WORKING GROUPS

Projects at or near completion

The following paragraphs review the progress made by SIGTTO's latest three working groups. Their projects have either recently been completed or are nearing completion.

1 Competency Assurance for Key Staff involved with LNG Operations (Human Factors)

This working group (WG) was established at the 64th SIGTTO General Purposes Committee (GPC) meeting in September 2011. The aim is to create a quality training regime for shore-based staff and trainers, based on the existing SIGTTO crew competency standards. The WG first met in December 2011 and has had numerous meetings since then.

Since the last update in the spring 2014 edition of SIGTTO News, a subgroup of the WG has produced a draft *Suggested Quality Standards for LNG Training Providers* to encourage the implementation of a quality framework

in LNG training services. This document will be submitted to the 70th GPC for consideration. This WG intends to complete its task by autumn 2014.

2 Use of Support Vessels in the Emergency Response and Protection of Liquefied Gas Carriers and Terminals

This WG was established at the 66th GPC meeting in October 2012. It first met in December 2012 and there have since been six further meetings. The WG is tasked with defining the expected response, by emergency response craft, for incidents relating to liquefied gas carriers at onshore terminals and offshore terminals. The WG will also create suggested competency standards that could assist with the training of response craft crews.

The WG is aiming to produce a publication and submit it for approval at the 71st GPC meeting in April 2015. This will enable the publication to be printed and made available by mid-2015.

3 Guidance for LNG Carriers Transiting the Panama Canal

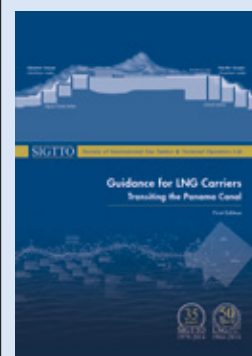
SIGTTO is pleased to announce that this WG has completed its task. The document, produced in anticipation of the opening

of the enlarged Panama Canal locks, was published in June 2014 and is available to purchase on the website of Witherby (<http://www.witherbyseamanship.com/guidance-for-lng-carriers-transiting-the-panama-canal.html>).

SIGTTO would like to thank the chairman and WG members for their time and effort in compiling the guidance and bringing this project to fruition. The WG was comprised of representatives from SIGTTO member companies and the Panama Canal Authority (ACP). SIGTTO recognises, with gratitude, the support and contribution of the ACP, which surpassed our expectations.

This WG was established at the 67th GPC meeting in April 2013 and first

met in May 2013. Three subsequent meetings were held, including the final meeting in January 2014.



Panama Canal transit guidance is now available

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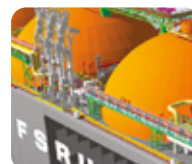
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Recent gas-related developments at IMO and EU

IGC Code update - The Revised International Gas Carrier (IGC) Code was adopted under amendments to the SOLAS Convention at the 93rd Session of IMO's Maritime Safety Committee (MSC 93) in May 2014. A concern was raised regarding the entry into force date and the subsequent effect on existing shipbuilding contracts. A compromise was reached when it was agreed that the entry-into-force date for the Revised Code will be 1 January 2016 but the application date will be for keels laid (or the beginning of identifiable construction work on the ship) on or after 1 July 2016. As a reminder, the revised IGC Code will not be retroactive.

IGF Code update - The IMO Correspondence Group tasked with making progress on the development of the International Code for Ships using Gas or other Low Flash-Point Fuels (IGF Code) completed their assigned work in June 2014. The draft Code, and outstanding issues associated with it, will be discussed at plenary and by the dedicated working group at the Carriage of Cargoes and Containers (CCC) Sub-committee in mid-September 2014. There are several major issues to be resolved, such as the approved location of LNG bunker tanks; the handling of electrical equipment in emergency shutdown-protected machinery spaces; how to address some other low-flash fuels such as methanol; and some finer points, like the exclusion of vessels already covered by the IGC Code.

Realistically, implementation of the IGF Code is at least 12 months behind the IGC Code. IMO appears to be looking to fast-track the IGF Code, with a target adoption date of spring 2015 and a resulting entry-into-force date sometime in the first half of 2017. Once the work on the initial Code is complete, other fuels such as LPG and hydrogen will be addressed.

EEDI for gas carriers - Amendments to MARPOL Annex VI were adopted at the 66th Session of IMO's Marine Environment Protection Committee (MEPC 66) in April 2014, to require LNG carriers with a non-conventional propulsion type to comply with the energy efficiency design index (EEDI) regime. The entry-into-force dates for these amendments are:

(a) shipbuilding contracts placed on/after 1 September 2015;

(b) keels laid on/after 1 March 2016; or

(c) delivery on/after 1 September 2019.

Calculation and certification guidelines for implementation of these amendments will be considered at MEPC 67 in October 2014.



IMO is targeting the first half of 2017 for the entry into force of the IGF Code

Blending of liquefied gas cargoes - IMO Resolution MSC.325(90), adopted in May 2012, amended SOLAS Regulation VI/5-2, prohibiting the blending of bulk liquid cargoes during sea voyages effective 1 January 2014. SIGTTO, in order to avoid any possible conflict with SOLAS, withdrew the 2005 document *Co-mingling of LPG - Alert to the Industry*. Due to some confusion over the wording, IMO has been requested to produce guidance with regards to the application of the new regulation. The guidance will be discussed at the next Pollution Prevention and Response (PPR) Sub-committee meeting in January 2015.

MARPOL Annex VI / Regulation 4 (Sulphur Equivalency) - The European Commission

and the EU Committee on Safe Seas and the Prevention of Pollution from Ships (COSS) have recently issued clarification regarding the application of MARPOL Annex VI, Regulation 4, for steam-propelled LNG carriers transiting the North Sea and Baltic Sea sulphur emission control areas (SECAs) after 1 January 2015, when the new 0.1 per cent sulphur limit will apply. The clarification would allow steam-propelled vessels not outfitted with separate distillate fuel systems, to operate in dual fuel mode (boil-off gas and fuel oil containing less than 0.5 per cent sulphur) within the SECAs. This precludes extensive modifications such as a separate distillate fuel systems and burner management changes.

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
- 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 very comprehensive technical library maintained in the London Office
- Submitting proposals for projects and studies to the General Purposes Committee

- Participating in discussion forums with other members each year on topics of particular and mutual interest
- Contact details of all members of SIGTTO
- New members receive a copy of all publications, free of charge, produced by SIGTTO
- Regular updates on matters affecting the industry such as legislation, either new or pending, technical or operational developments.
- 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.



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NEW MEMBERS

Half dozen onboard

Six companies have joined the SIGTTO membership since the last Newsletter was published. The new members and their date of joining the Society are shown below. The SIGTTO membership now stands at 137 full members, 40 associate members and 25 non-contributory members.

UltraShip	1 Jul 2014
Queensland Curtis LNG	1 Aug 2014
Gladstone LNG	1 Aug 2014
POSCO	1 Aug 2014
EgeGaz	1 Oct 2014
Avance Gas	1 Oct 2014

UltraShip ApS is a newly established ship management company active in the technical management of gas carriers of the semi-pressurised/fully refrigerated (semi-ref) type, including ethylene carriers, operated by its affiliates Unigas and Ultragas. UltraShip took over the management of its first vessel, the 8,600m³ LPG carrier *Happy Bird*, in April 2014 and will gradually assume the management of further units in the Unigas and Ultragas pools in the months to come, including all vessels in the extensive Ultragas newbuilding programme. Like Ultragas, UltraShip is based in Copenhagen, Denmark.

Queensland Curtis LNG (QCLNG) is a new LNG export project based on Curtis Island in the port of Gladstone on Australia's east coast. QCLNG will process coal seam gas piped from the vast Queensland coal fields and is on track to begin producing LNG in late 2014. The two-train plant is capable of producing 8.5 million tonnes per annum (mta) of LNG. The QCLNG project is led by BG Group.

Gladstone LNG (GLNG) is also a new Curtis Island LNG export project and, like QCLNG, will process coal seam gas from the Queensland coal fields. The two-train, 7.8 mta GLNG plant is due to come onstream in 2015. Santos is the operator of GLNG and holds a 30 per cent stake in the project. The other participants are Total and Petronas, each with a 27.5 per cent share, and Korea Gas Corp, with 15 per cent.

POSCO is a private South Korean steel maker and owns and operates Gwangyang, the country's only privately owned LNG import facility. The terminal has four storage tanks with a total capacity of 530,000m³ and to date is the only facility in the Pacific Basin to have been used for LNG cargo re-exports. Both POSCO and SK E&S use Gwangyang to import LNG from the Tangguh project in Indonesia under long-term contract.

EgeGaz operates Turkey's second LNG import terminal, the Aliaga facility near Izmir on the Aegean Sea. The terminal has two 140,000m³ storage tanks and the capacity to import and regasify up to 4.5 mta of LNG. Operations include local deliveries of LNG in cryogenic road tankers. EgeGaz is part of the privately owned Colakoglu Group.

Avance Gas is an owner and operator of fully refrigerated LPG tankers of the very large gas carrier (VLGC) type. Stolt-Nielsen, Sungas and Frontline 2012 are joint equal shareholders in the venture. Including Frontline's eight-vessel newbuilding programme at the Jiangnan shipyard in China, there are currently 14 VLGCs in the Avance Gas fleet. All eight are due to be in service by August 2015.



Iris Glory is one of six VLGCs in the current in-service Avance Gas fleet

SECRETARIAT

Membranes for the office

The Secretariat has recently had to clear some space at head office for an eye-catching gift from Gaz Transport & Technigaz (GTT). The French engineering firm graciously sent to SIGTTO cutaway sections of its No 96 and Mark III membrane tank containment systems following the Society's technical visit to GTT's premises on the outskirts of Paris in May this year.

The cutaways show the barrier materials and the insulation arrangements that go together to make up the two most popular containment systems in LNG shipping. The Secretariat staff, well familiar with the components of the two systems, ensured that the correct insulation boxes and secondary barrier were married to the appropriate primary barrier.



The sections of the GTT No 96 and Mark III membrane tank systems are now a prominent feature of the SIGTTO conference room

COMMUNICATIONS

SIGTTO on Twitter

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FSRU Toscana - an offshore first

OLT Offshore LNG Toscana SpA is playing host to SIGTTO's 60th Panel Meeting in its home city of Livorno in Italy on 8-9 October 2014. The company has also organised a technical visit for Panel delegates to the *FSRU Toscana* floating LNG receiving terminal that it operates. Stationed 22km off the Italian coast near Livorno, *FSRU Toscana* heralded a major breakthrough for the LNG industry when it was commissioned in December 2013.

FSRU Toscana is the world's first permanently moored offshore floating storage and regasification unit (FSRU). The 137,500m³, 2004-built, spherical tank LNG carrier *Golar Frost*, was converted for its new regas vessel role by Saipem SpA in the Drydocks World Dubai (DDW Dubai) yard.

Following a long and complex permitting path carried out over the past 10 years, the proposed *FSRU Toscana* project was acknowledged by the competent authorities as a terminal in compliance with laws and standards governing safety and environmental protection.

As a result of the need to provide the highest levels of safety and supply security for this milestone project, and to tackle the challenges encountered along the way, development work on *FSRU Toscana* was extended. Following identification of an LNG carrier suitable for modification, two years of front-end engineering and design (FEED) study were carried out and the yard began physical conversion work on *Golar Frost* in 2009.

On completion of the conversion in summer 2013, the FSRU was towed to its position off the Italian coast. Final installation and hook-up was carried out in August 2013 and the following month the 126,000m³ delivery tanker *LNG Leo* arrived with a commissioning cargo.

The commissioning phase commenced on 2 September 2013 when *LNG Leo* moored alongside *FSRU Toscana* in the side-by-side mode. Following connection of the special offshore marine loading arms on the deck of *FSRU Toscana* and the gassing up and cooling down of all the cargo tanks, 109,000m³ of LNG was successfully transhipped to *FSRU Toscana* in an operation that was completed on 8 September.

Three further LNG cargoes were offloaded to the FSRU in ship-to-ship (STS) transfer operations as part of the commissioning phase. A cargo of 116,000m³ was transhipped on 15-16 October, one of 119,000m³ on 8-9 November and one of 70,000m³ on 1-2 December 2013.



On station off the Italian coast, *FSRU Toscana* establishes a new milestone in offshore LNG operations

On 5 October 2013, following completion of all the necessary safety and environmental checks to the satisfaction of the relevant Italian competent authorities, *FSRU Toscana* commenced introducing regasified cargo into the gas grid of Snam Rete Gas. In December 2013 OLT Offshore LNG Toscana announced that the *FSRU Toscana* commissioning phase had been successfully completed and that the project had commenced commercial operations.

FSRU Toscana has been designed to remain on station for 20 years without drydocking. The conversion work carried out by Saipem at DDW Dubai involved removing the vessel's propulsion system and installing a sophisticated turret mooring system at the bow and loading arms on deck amidships.

In addition the necessary regasification, boil-off gas handling and metering equipment was installed on the limited deck space available forward of the four spherical cargo tanks. The complement of equipment provides a flexible regasification capacity of up to 15m³/day, a wide-ranging Wobbe index correction capability, power generation from the boil-off gas, fiscal metering for the onshore grid entry point and low levels of environmental emissions. The vessel's peak regasification capacity is 450 tonnes/hour of LNG.

OLT Offshore LNG Toscana contracted FMC Technologies to design, develop and supply *FSRU Toscana's* offshore loading arms. The four 16-inch arms are designed to accommodate the relative motions between two vessels moored together in open sea and can handle STS transfers at rates as high as 12,000 m³/hr for LNGCs of up to 155,000m³ in seas with wave heights of 2.5m. The targeting system incorporated in the FMC package facilitates the connection of the arms to the delivery tanker's manifold over a range of sea states.

The water depth at the location where the vessel is moored is 120m. *FSRU Toscana* weathervanes around its turret

mooring arrangement and the installation includes six moorings lines, two risers and various umbilical lines. Following the regasification process natural gas is directed to the national grid ashore via a 36.5km long pipeline which is also operated and managed by Snam Rete Gas.

OLT Offshore LNG Toscana is a joint venture company in which E.ON holds a 46.79 per cent stake, Iren Group 46.79 per cent, OLT Energy Toscana SpA 3.73 per cent and Golar LNG 2.69 per cent.

The company has contracted ECOS srl, a 60/40 Exmar/Fratelli Cosulich joint venture, to handle the technical management of operations onboard the regas vessel. *FSRU Toscana*, which is classed with Registro Italiano Navale (RINA), has the capacity to regasify approximately 2.8 million tonnes per annum of LNG, equivalent to about 4 per cent of Italy's gas demand.



@SIGTTO

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