



Houston Forum (p6)



Regulations (p9)



Profile (p12)

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MESSAGE FROM GENERAL MANAGER



SIGTTO Strategic Plan shows way forward

Andrew Clifton, the SIGTTO General Manager, describes how the Society's new Strategic Plan lays down a roadmap for the future

As LNG shipping embarks on its second half century, it is important that we do not forget the proud safety record that our industry has achieved. SIGTTO remains the industry leader for disseminating best practice procedures and providing technical support for the liquefied gas shipping and terminal sectors. In this way the Society has a central role to play in maintaining this safety record.

It is necessary for SIGTTO to reappraise its goals and adapt accordingly from time to time. This is done not only to meet the ever-changing requirements of our industry but also to ensure that we remain relevant and fit for purpose as we strive to meet the needs and expectations of the membership in the 21st century.

To facilitate achievement of these goals SIGTTO has prepared an updated Strategic Plan and the completed document was approved at the Autumn Board and Annual General Meeting in November 2015. The Plan outlines the direction that the Society intends to take for the rest of the decade and progress will be reviewed at each Board. The Strategic Plan, which is available on the SIGTTO website, is set to play a key role in the future of the Society. It is described in more detail on page 5.

The Society is funded predominantly by members' fees. These fees have remained unchanged since 2007 and are recognised as being highly competitive in comparison with those levied by similar non-governmental organisations



There was only one space left for SIGTTO's
Rick Boudiette in the group photo onboard the Royal Yacht Britannia

(NGOs). In a decision not taken lightly, the November 2015 Board and AGM agreed to increase the membership fees for 2016.

The increase was agreed for two reasons. First, the operating cost of the Society has steadily increased, to the point where it is now equal to the income from members' fees. This is despite the continuous rise in the number of members over the last decade. It was therefore recognised that an adjustment is required to meet the cost of the current resources and services provided to the membership.

Secondly, SIGTTO is preparing to embark on a new phase. The future vision of the Society, as laid out in the Strategic Plan, allows for a much larger Secretariat in order to meet the needs and expectations of a growing and changing membership with a more diverse range of requirements.

As this is not only the first increase in members' fees in nine years but also a modest one, SIGTTO is confident that the membership will appreciate why the revised rates have been necessary as well as the extra value that the Society will be able to provide under the new Strategic Plan. >

"Our Strategic Plan provides SIGTTO with a firm roadmap for the rest of the decade and good reason to be optimistic about the future."

IN THIS ISSUE

| | |
|-----------------------------------|----|
| Message from General Manager..... | 1 |
| Upcoming SIGTTO Meetings..... | 3 |
| SIGTTO Strategic Plan..... | 5 |
| New Technical Adviser..... | 5 |
| Houston Forum..... | 6 |
| Everett celebrates 45 years..... | 7 |
| Membership benefits..... | 7 |
| Working Group updates..... | 9 |
| IMO/EU developments..... | 9 |
| New Members..... | 11 |
| US Coast Guard profile..... | 12 |

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MESSAGE FROM GENERAL MANAGER

> A total of 17 companies joined SIGTTO as members in 2015, a new annual record. These companies were from all sectors of the liquefied gas shipping and terminal industry, including several from the new ethane transportation sector. Such an influx was most pleasing to see and the Society will continue to encourage new members to join, including by reviewing the membership eligibility of new industry sectors. The recent amendment of the byelaws to enable operators of compressed natural gas (CNG) carriers and container ships carrying LNG in cryogenic ISO tank containers to join SIGTTO as associate members is an example of how the membership base is being broadened.

The Secretariat's staff has recently been augmented and I would like to extend a warm welcome to Robert (Bobby) Steele who has joined us for three years on secondment from ExxonMobil. Bobby brings with him a wealth of LNG and marine engineering experience, as described on page 5, and we are grateful to ExxonMobil for his services.

SIGTTO also expects to have a scheduled change in the Society's president during 2016 as well as a new vice president and a new General Purposes Committee (GPC) chairman upon completion of their respective terms of office.

Also on this year's agenda are the finalisation and appearance of three SIGTTO publications, i.e. *Liquefied Gas Handling Principles, Support Craft at Liquefied Gas Facilities - Principles of Emergency Response and Protection - Offshore* and *Guidance for the Operation and Maintenance of Loading Arm Emergency Release Systems*. The work underpinning these documents and other current SIGTTO projects is covered on page 9.

Since the last edition of *SIGTTO News* appeared in autumn 2015 a number of meetings involving wide-ranging engagement with the membership have been held. The 72nd GPC was hosted by Witherbys, the Society's publishers, in Edinburgh on 30 September 2015 in tandem with a European Regional Forum the following day. With 99 participants in the room, that event broke the attendance record for a SIGTTO regional forum!

In December 2015 the US Coast Guard (USCG) hosted SIGTTO's Pan American Regional Forum meeting. The membership was also able to participate in a seminar and technical visit jointly hosted by the USCG, the Society for Gas as Marine Fuel (SGMF) and SIGTTO on the two days following the regional forum. Some of the seminar proceedings are covered on page 6 while the work of the USCG in relation to our industry is profiled on page 12.

In October 2015 SIGTTO attended the Gastech conference in Singapore where

I chaired the shipping session and spoke on the student programme. Our technical adviser Rick Boudiette presented a paper during the shipping session dealing with how the industry can learn from the exemplary safety record built up by the LNG carrier fleet over its 50 years of operations. SIGTTO shared an exhibition stand with Witherbys at Gastech and it was pleasing to engage with so many of the Society's members at this leading industry event.

As the list of upcoming meetings below indicates, SIGTTO has another busy year lined up. The 12 regional forums planned for 2016 will itself set a record for meetings of this type. The roster includes maiden forum visits to Tokyo and India and a return to South America.

There will be no spring SIGTTO Panel Meeting this year due to the clash with the major LNG 18 industry event in Perth. Unicom has kindly offered to host the autumn Panel in Cyprus while this year's two Board meetings will take place in Boston and Japan.

The archive basement store in SIGTTO's office has finally been emptied after serving for many years as a repository for a growing pile of paperwork. The clearance of the "dungeon" is down largely to the great efforts of Andrea Baseley, SIGTTO's office manager, who, having donned a dust mask and rolled up her sleeves, set about clearing the space towards the end of last year!

Andrea sorted through many dusty boxes of old papers and uncovered a treasure trove of past photographs of early SIGTTO gatherings; numerous faded minutes; and

documents from 1980s and 1990s Panel and Board meetings. The important documents were retained and the basement was released back to the landlord as part of the office lease extension. Under its terms the Secretariat will remain in the current premises until the autumn of 2018.

At the time of going to press the merger between Shell and BG was taking effect. We would like to give a "nod" to BG for the significant part the company has played in developing the LNG shipping industry, from the early days of *Methane Pioneer* and *Methane Princess* right up to its recent efforts to make LNG carriers more efficient through lower boil-off gas rates and reduced main engine fuel consumption. BG will be missed as a key SIGTTO and industry member but we look forward to working with the enhanced Shell group which will now be involved with around 70 LNG vessels.

The Society is pressing forward with many projects and initiatives, most originating from the GPC but some from IMO and other sources. We continue to prioritise our work with an emphasis on a risk-based approach. This enables us to focus on the major safety issues of the day, including those relating to process safety, and to avoid covering topics outside our remit, such as those of a commercial nature.

SIGTTO remains in good shape and is financially sound, with a strong supportive Board and membership. The new Strategic Plan provides the Society with not only a firm roadmap for the rest of the decade but also good reason to be optimistic about the future.

| UPCOMING MEETINGS | DATE | LOCATION |
|---------------------------------|-------------|--------------|
| 73rd General Purposes Committee | 11 Apr | Perth |
| Spring Board Meeting | 17 May | Boston |
| Pan American Regional Forum | 19 May | Houston |
| Singapore Regional Forum | TBC | Singapore |
| Mediterranean Regional Forum | TBC | Athens |
| Scandinavian Regional Forum | TBC Jun/Jul | Oslo |
| Middle East Regional Forum | TBC Jun/Jul | TBC |
| European Regional Forum | TBC Jun/Jul | London |
| South American Regional Forum | 27 Sep | Buenos Aires |
| 74th General Purposes Committee | 4 Oct | Cyprus |
| 62nd Panel Meeting | 5-6 Oct | Cyprus |
| China Regional Forum | TBC Nov | Shanghai |
| Asian Regional Forum | 15 Nov | Tokyo |
| Autumn Board Meeting & AGM | 18 Nov | Nagoya |
| Pan American Regional Forum | TBC Nov/Dec | Houston |
| Australian Regional Forum | 7 Dec | Perth |
| India Regional Forum | TBC Dec | Mumbai |
| 75th General Purposes Committee | 3 Apr 2017 | Tokyo |

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Strategic Plan to realise 2020 vision



SIGTTO has drawn up its *Strategic Plan 2016* to ensure that the Society remains relevant and fit for purpose to meet the needs and expectations

of the membership in the 21st century.

The document takes into account the many technological advances that have been made in the gas shipping and terminal sectors over the last 10-15 years as well as the brisk growth in the number of members.

"The Society's membership now stands at over 200 companies," states SIGTTO General Manager Andrew Clifton, "and includes many new players from emerging markets, such as China, South America and India, who have rapidly increasing liquefied gas interests but limited experience to draw upon. The need to disseminate a constantly growing body of industry knowledge to a wider and wider audience is greater than ever before."

The Strategic Plan recognises that SIGTTO's resources will need to be expanded in order to meet the demands created by the industry's expansion and new activities and to reach that point where the Society believes it should be in 2020. The goal of this so-called "2020 vision" has been laid down as follows:

"SIGTTO will be recognised as the foremost gas shipping and terminal industry body, a modern centre of industry expertise, with all appropriate resources available to address industry technical



LNG operations not contemplated 10 years ago are now taking place

and operational issues. In addition, SIGTTO 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."

The deployment of greater resources, especially technical resources, will allow for more projects and studies, as directed by SIGTTO's General Purposes Committee, to be carried out more expeditiously than is currently the case.

In addition the Secretariat will be able to address emerging technologies and launch new initiatives. It is anticipated that such initiatives will include making more beneficial

use of incident trends and statistics; introducing a robust process for sharing and addressing lessons learnt; and establishing new sub-committees, such as ports and terminals and human factors/training, to optimise cross-functional engagement.

Additional resources will also increase the Society's ability to address issues relating to process safety, human factors and training in the ongoing drive to preserve the industry's proud safety record.

"The objectives, goals and action plans laid down in the *Strategic Plan 2016* will need to be fully and rigorously implemented if we are to achieve our 2020 vision," concludes Andrew Clifton.

TECHNICAL ADVISER

Bobby Steele joins SIGTTO team



SIGTTO's complement of Technical Advisers is now up to three, Robert (Bobby) Steele having arrived at the London Liaison Office in October

2015 under a three-year secondment from ExxonMobil. Bobby brings with him a career's worth of experience of liquefied gas shipping, encompassing both time afloat and ashore.

SIGTTO's new Technical Adviser got his first taste of the sea as an engineer cadet with Ocean Fleets, sailing with Elder Dempster to West Africa and to the Far East with Blue Funnel.

His time with Ocean Fleets also brought him into contact with an LNG ship for the first time. The vessel in question was

the 1976-built *Nestor* which was laid up at Loch Striven in Scotland for 14 years because the US West Coast import project for which it was earmarked never came to fruition. "The fact that it was intended to locate the California receiving terminal on a native Indian burial site didn't help the project's chances," points out Bobby.

Bobby Steele then spent time on oil tankers with various companies, sailing 'deepsea' for the first time as a chief engineer at the age of 26. Following time on Maersk's C-class LPG carriers, he joined Mobil Shipping in 1991 as a second engineer and in 1992 became the oil company's youngest-ever chief engineer.

Bobby moved ashore as superintendent in 1999, around the time that Exxon and Mobil merged, and from 2003 onwards became involved with Qatar's Q-flex/Q-max vessel design and construction project. This led to a move to Qatar in 2005 as the Qatargas project manager

for the ships building at Samsung Heavy Industries in South Korea on behalf of Qatargas and RasGas. Over 25 LNGCs of the conventional, Q-flex and Q-max types were completed during this 2005-2010 posting in which he represented the interests of both charterers and owners.

Bobby Steele continued to work with Qatargas as post construction team deputy manager before moving to RasGas in 2011 as technical adviser. The latter tenure included involvement in projects such as ballast water treatment system installations and the conversion of a Q-max vessel's conventional propulsion system to dual-fuel running.

"I departed Qatar in October 2015 after nearly 11 years in the country to take up my latest posting," reports Bobby Steele. "I am currently very much enjoying the change of location as well as the challenges and variety entailed in my new SIGTTO work activity."



The Targa LPG terminal on the Houston Ship Channel is loading a rapidly increasing number of export cargoes

US gas carrier activity set to blossom

SIGTTO cooperated with the US Coast Guard and the Society for Gas as a Marine Fuel (SGMF) in hosting a joint three-day forum in Houston in December 2015. The event reflected the current expansion of gas carrier and terminal activities in the US as well as the introduction of LNG-powered ships and LNG bunkering in that country.

A total of 39 presentations were delivered during the course of the proceedings. The following paragraphs review several of the papers that focused on the impact that US exports of LNG, LPG and ethane are having on gas carrier developments.

Five worldscale LNG projects

As Michael Ratner, a specialist in energy policy with the US Congressional Research Service highlighted at the forum, US natural gas production rose by 34 per cent between 2007 and 2014, thanks to exploitation of the country's rich shale gas resources. Plentiful supplies have put downward pressure on US gas prices and increased the attractiveness of US product, in the form of LNG, in world markets.

Five terminal construction projects are underway that will provide the US with an aggregate LNG export capacity of 64.7 million tonnes per annum (mta) of LNG by 2020. The volume is equivalent to just over one-quarter of the current global trade in LNG but only about 10 per cent of overall US gas production. The first cargo from

these LNG projects - a commissioning shipment from the Sabine Pass terminal in Louisiana - was loaded in February 2016.

In his presentation Aziz Bamik, general manager of Gaztransport & Technigaz (GTT) North America, looked at the fleet of ships likely to be required to lift the full volume of US LNG exports and the gas ship technology work of his company relevant to this traffic.

Using a Poten & Partners October 2014 projection of 2.2 LNG carriers for every 1 mta of US exports translated into the need for a fleet of 140 ships to transport US LNG exports. However, this projection was made at a time when most cargoes were expected to travel westbound across the Pacific, through Panama's new, enlarged locks, to energy-hungry customers in Asia. Since then demand in Asia has slumped and a significant percentage of US LNG output is now expected to be sold to Atlantic Basin utilities, at least initially. Due to the shorter distances involved this, in turn, will mean that a smaller fleet will be needed for US export cargoes.

Aziz Bamik stated that of the 53 ships in the current LNGC orderbook definitely earmarked for US cargoes, 36 will have GTT membranes of one type or another. All 36 of the newbuildings will be fitted with the latest membrane technologies that provide lower boil-off gas (BOG) rates than the 0.15 per cent of the cargo volume per day offered by GTT's traditional Mark III and NO 96 systems.

The 17 vessels to be fitted with Mark III Flex systems will ensure a BOG rate of 0.085-0.09 per cent while the two ships with NO 96 LO3 systems will be capable of 0.105 per cent. Another 17 ships will have

NO 96 GW systems which, in tandem with partial liquefaction systems on the ships, will yield a BOG rate of 0.075 per cent.

LNG and LPG services

Lars Pedersen, managing director of BW Fleet Management, told the forum audience that his group's *BW GDF Suez Boston* and *BW GDF Suez Everett*, on 20-year charters to Engie, have been delivering LNG cargoes to the Everett terminal in Boston harbour since 2003.

As part of its US Coast Guard Riders Program, BW LNG takes two USCG cadets per year on its Everett ships as the final part of their education before deployment as inspectors. The arrangement not only helps in developing a good relationship with the Coast Guard but also facilitates inspections in Boston as nearly all the inspectors have been riders and are familiar with the vessels.

Another group company, BW LPG, operates the world's largest fleet of very large gas carriers (VLGCs) and these ships are participating in the surge in US LPG export shipments already underway. Lars Pedersen told delegates that group VLGCs lifted 58 LPG cargoes at US ports in 2014 while the 2015 total had reached 40-plus by September.

Capt Lambros Klaoudatos, marine & technical assurance manager with BP Shipping (USA), reported that his company owns and operates eight LNG carriers and three 83,000m³ VLGCs. The VLGC fleet handled 1 million tonnes (mt) of LPG in 2015 but this is expected to grow to 3 mt this year as a result of rising US exports. One

consideration when handling US propane shipments is the fact that the product has a higher ethane content, of up to 2 per cent, than that encountered in the rest of the world.

Ethane on the map

Evergas, a Danish company wholly owned by Greenship Gas and Jaccar Holdings, is a gas carrier operator currently establishing a strong presence in the emerging ethane sector. Hans Weverbergh, senior LNG operations manager with the company, told delegates that Evergas has secured the world's largest ethane shipping contract to date.

Through the deal, which is with Ineos, Evergas has also become the first transporter of ethane out of the US. Ineos is chartering eight 27,500m³ multipurpose LNG/ethane/ethylene carriers that Evergas is building in China to lift ethane cargoes at the Mariner East terminal near Philadelphia for use as feedstock in its petrochemical plants in Norway and Scotland.

The Wärtsilä medium-speed dual-fuel engines fitted on the 27,500m³ ships, which Evergas terms its *Dragon*-class vessels, traditionally run on LNG in the gas mode and each of the gas carriers has a pair of deck tanks offering space for 2,000m³ of LNG bunkers to accommodate this fuel option. However, Wärtsilä successfully tested a prototype engine running on ethane at its Bermeo facility in northern Spain in April 2015, opening up the possibility of powering the ships on cargo boil-off gas on their transatlantic runs.

Evergas/Jaccar is also partnering Hartmann in United Ethane Carriers (UEC), a company which is building five 85,000m³ ethane carriers at the Sinopacific yard in China for long-term charter to Oriental Energy (Nanjing). Unlike the other very large ethane carriers on order, which are being built to the fully refrigerated design, the UEC ships, like the *Dragon*-class vessels, are being constructed as semi-pressurised/fully refrigerated (semi-ref) gas carriers.

The design, which UEC calls its EcoStar 85K concept, features IMO Type C pressure vessel cargo tanks. As Hans Weverbergh pointed out, the quintet will be, by a wide margin, the largest semi-ref gas tankers ever built.

Under the 10-year time charter contract with Oriental Energy, the EcoStar 85K gas tankers will carry ethane to China from a new dedicated terminal that Enterprise Products Partners (EPP) is building at Morgan's Point on the US Gulf Coast. The facility, at the entrance to the Houston Ship Channel in Texas, is due for commissioning in the third quarter of 2016 and will have an ethane loading capacity of 7.6 mta.

Everett celebrates 45 years of service

Amongst the industry pioneers celebrating a notable anniversary this year is the Distrigas terminal in the Boston suburb of Everett, Massachusetts. The arrival of the inaugural cargo some 45 years ago, onboard the 50,000m³ membrane tank *Descartes* in November 1971, marked the commissioning of the first LNG receiving facility in the US and the Western Hemisphere. Only three LNG import terminals worldwide have been in service longer than the Distrigas installation. The Distrigas LNG facility, also known as the Everett Marine Terminal, is situated on the Mystic River which feeds into Boston harbour. As ships discharging cargoes have to pass under the Tobin Bridge to reach the installation, Everett is one of the few LNG terminals to impose vessel air draft restrictions.

The two storage tanks at the site have an aggregate capacity of 155,000m³ and the facility has been in continuous operation since the delivery of the inaugural cargo. The US Coast Guard implements a rigorous safety and security regime for LNG carriers visiting Everett.

During the early years of the terminal's service life *Descartes* delivered 12-16 cargoes of Algerian LNG per annum but that ship was eventually superseded by larger ships carrying more cargoes from more locations.

At times of high activity the terminal handles one cargo per week. Everett became part of what is now the Engie group in 2000 and in December 2010 it received its 1,000th cargo.

Everett Marine Terminal has the capacity to meet about 20 per cent of New England's annual gas demand. Most of the terminal's throughput is regasified on site and fed into the local gas grid. An important customer is Exelon's neighbouring, 1,950 MW, gas-fired power plant.

However, the terminal also has four road loading bays where cryogenic tank trucks are filled with LNG for distribution to over 40 small satellite stations throughout New England. The bays handle an average of 10,000 tank truck loadings per year. These deliveries account for about 10 per cent of Everett's throughput and enable customers not connected to the pipeline grid to enjoy the benefits of natural gas.

SIGTTO will be holding its Spring Board Meeting this year in Boston, on 17 May.



LNG carriers have been part of the Boston seascape for 45 years

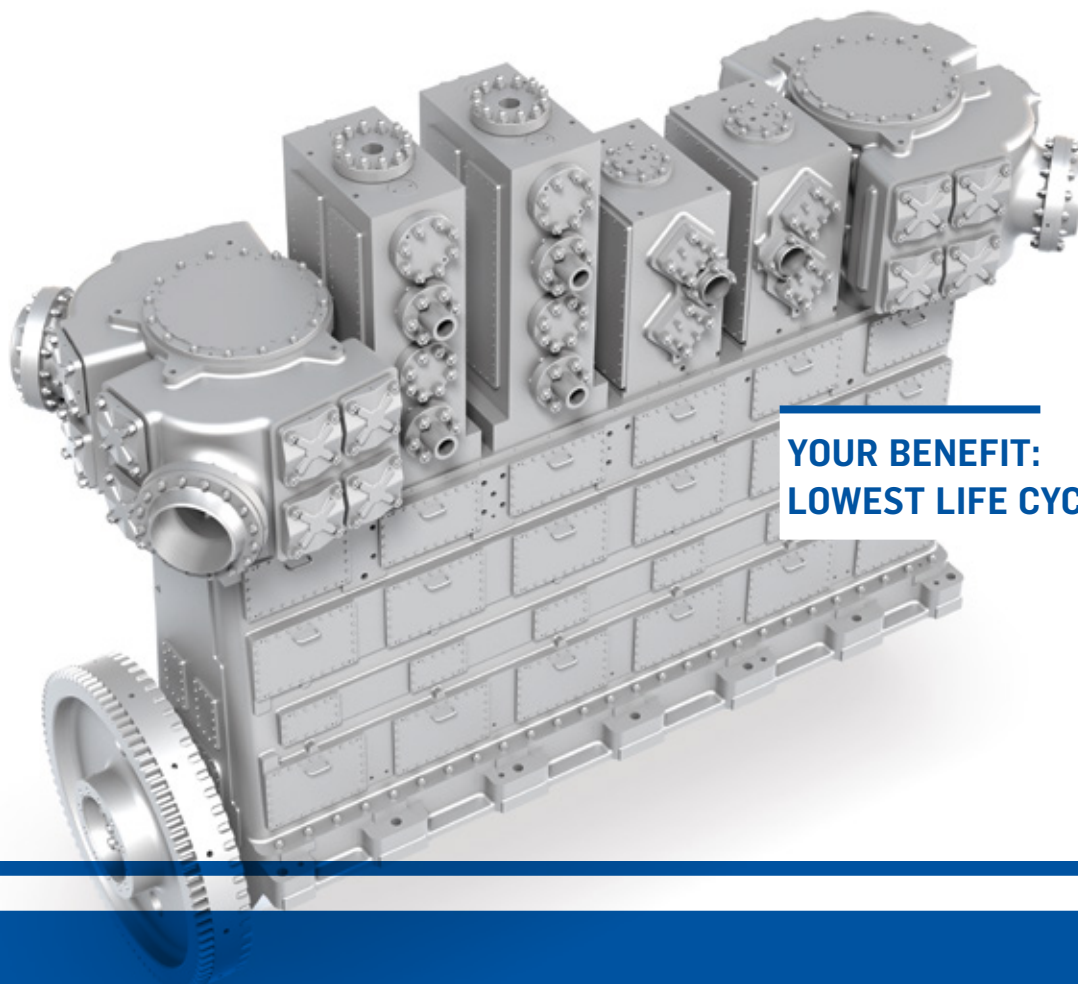
BENEFITS OF SIGTTO MEMBERSHIP

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



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WORKING GROUPS

Project updates

The following paragraphs review the progress made by SIGTTO's latest four working groups. All aim to complete their projects during the course of 2016 to enable the publication of the relevant guidance.

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

This working group (WG) was established at the 66th SIGTTO General Purposes Committee (GPC) meeting in October 2012. The group first met in December 2012 and has since gathered for nine further meetings. The WG is tasked with defining the expected response, by emergency response craft, during incidents involving liquefied gas carriers at onshore terminals and offshore facilities.

As described on page 9 of the Autumn 2015 edition of *SIGTTO News*, the WG produced a document on emergency response principles for onshore terminals which was published in mid-2015.

Preparation of the second and final publication in this series - on emergency response at offshore facilities - is underway and the WG is aiming to complete its work in 2016.

SIGTTO's current workload includes an initiative to upgrade its LPG ship/shore interface guidance



2 Emergency Release System (ERS) Failures -

This WG was established at the 70th GPC meeting in October 2014 and first met in January 2015. The WG is tasked with examining all safety aspects relating to the operation of emergency release systems (ERS). The aim is to identify the possible root causes of ERS-related incidents and develop guidelines and best practices to avoid such incidents in the future. The WG is aiming to complete its work in 2016.

3 LPG Ship/Shore Interface - Established at the 70th GPC meeting in October 2014, this WG held its inaugural meeting in February 2015. The WG is tasked with identifying the possible root causes of LPG ship/shore

interface-related incidents and updating or rewriting SIGTTO's 1997 publication *Ship/Shore Interface Safe Working Practice for LPG and Liquefied Chemical Gas Cargoes*.

The work is being carried out in order to raise the safety awareness of the LPG shipping and terminal sectors and to minimise the risk of LPG ship/shore interface-related incidents in the future. The group aims to complete its work in 2016.

4 Gas Carrier Manifolds - At the 72nd GPC meeting, which took place in September 2015, it was decided to form a WG to revise the 2011 SIGTTO publication *Manifold Recommendations for Liquefied Gas Carriers*. The group aims to complete its work in 2016.

REGULATIONS

Recent gas-related developments at IMO and EU

IGF Code: The International Code of Safety for Ships using Gases or other Low-Flashpoint Fuels (IGF Code) enters into force on 1 January 2017. As a reminder, gas carriers are exempt from the IGF Code provided:

- (a) they use their cargoes as fuel and comply with the requirements of the International Gas Carrier (IGC) Code; or
- (b) they use other low-flashpoint gaseous fuels and the design and arrangements for the fuel storage and distribution systems comply with the requirements of the IGC Code for gas as a cargo.

Work on Phase 2 of the IGF Code, covering the use of low-flashpoint diesel, fuel cells and methanol as means of propulsion, continues via Correspondence Group under the purview of IMO's Carriage of Cargoes and Containers (CCC) Sub-committee.

IGC Code: The International Gas Carrier (IGC) Code entered into force on 1

January 2016, and will apply to vessels whose keels are laid on/after 1 July 2016. Several Unified Interpretations have been submitted for consideration at the 96th Session of IMO's Maritime Safety Committee (MSC 96) in May 2016.

SIGTTO continues to work with the Membrane Owners' Group on an *Isolated Vapour Pocket Awareness* document to clarify IGC Code changes relating to maximum cargo tank filling limits on ships with membrane containment systems.

At the request of Australia and Japan, IMO initiated a Correspondence Group under the CCC Sub-committee to develop *Interim guidelines for the carriage of liquefied hydrogen*, with a view to finalising the guidelines at CCC 3 in September 2016.

EU: The European Sustainable Shipping Forum (ESSF) is developing guidelines for implementation of the European Commission's Monitoring, Reporting and Verification (MRV) regulation for quantifying and reducing ship CO₂ emissions. The MRV regulation will be a mandatory EU version of IMO's recommendatory Energy Efficiency Operational Indicator (EEOI).

The MRV regulation requires

shipowners and operators to annually monitor, report and verify CO₂ emissions for vessels of 5,000 gross tons or larger calling at any EU port. Data collection, which will take place on a per voyage basis, is set to start on 1 January 2018.

Under the current proposals LNG carriers will use volume, as per the custody transfer measurement system (CTMS) readings, to determine the amount of cargo carried and boil-off gas (BOG) burned as propulsion fuel. Other gas carriers will use mass, as per bills of lading, to determine cargo carried.



Under the proposed MRV regulation LNG carriers in European waters will use custody transfer readings to determine the amount of cargo carried

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NEW MEMBERS



Ineos is chartering Evergas ships to carry cargoes from the Mariner East ethane export terminal operated by Sunoco Logistics

Nine more onboard

Nine 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 141 full members, 45 associate members and 26 non-contributory members.

| | |
|-----------------------------|------------------|
| Steelhead LNG | 1 September 2015 |
| NextDecade LLC | 1 November 2015 |
| PT Donggi | |
| Senoro LNG | 1 November 2015 |
| Jordan Cove LNG | 1 November 2015 |
| Sunoco Logistics LP | 1 December 2015 |
| Ineos | 1 January 2016 |
| Warsash Maritime Academy | 1 March 2016 |
| Wilhelmsen Fleet Management | 1 March 2016 |
| Flex LNG | 1 March 2016 |

Steelhead LNG is promoting Malahat LNG, a Canadian export project that will make use of a floating LNG production (FLNG) vessel. The shoreside-moored facility would have the capacity to liquefy 6 million tonnes per annum (mta) of LNG for 25 years and be positioned 8km south of Mill Bay on Vancouver Island in British Columbia. Canada's National Energy Board has granted permission for the Malahat exports and Steelhead LNG is targeting a 2017 final investment decision (FID) on the project, following completion of a front-end engineering and design (FEED) study.

NextDecade is another company aiming to make an FID on a proposed North American LNG export project in 2017. The scheme in question is Rio Grande LNG, an initiative which calls for a two-train terminal with a capacity of 9 mta to be in constructed in Brownsville, Texas by late 2020. NextDecade reports that Rio Grande LNG could be

expanded with the addition of four further trains in future, should the need arise.

Donggi Senoro LNG (DSLNG) operates Indonesia's third in-service liquefaction plant. The 2.1 mta DSLNG facility loaded its first cargo, a shipment for the country's Arun receiving terminal, in August 2015. The terminal is located about 25km southeast of Luwuk in Central Sulawesi. Sulawesi LNG Development - a joint venture of Mitsubishi Corp and Korea Gas Corp (Kogas) - holds a 59.9 per cent stake in the project, while PT Pertamina Hulu Energi controls 29 per cent and PT Medco LNG Indonesia 11.1 per cent. DSLNG is contracted to deliver, under long-term sale and purchase agreements, 1 mta to Chubu Electric Power, 0.3 mta to Kyushu Electric Power and 0.7 mta to Kogas.

Jordan Cove LNG plans to build an LNG export terminal at Coos Bay in the US state of Oregon. The project has been given US Department of Energy clearance to export 6 mta of LNG for 20 years to customers worldwide. Gas for liquefaction would be piped overland from deposits in western Canada. Jordan Cove LNG is a subsidiary of Veresen, a diversified energy infrastructure company that owns and operates assets across North America. Veresen is yet to take an FID on the Jordan Cove project.

Thanks to the rich Marcellus natural gas liquids shale plays of western Pennsylvania, **Sunoco Logistics** is playing a key role in the rejuvenation of Philadelphia as a leading US oil and gas port. Sunoco is bringing onstream the Mariner East ethane loading facility at its former Marcus Hook refinery complex near the city. Mariner East will have the capacity to export up to 1.9 mta of ethane. Most of the product is destined for shipment to Europe on behalf of Ineos and Borealis for use as petrochemical plant feedstock. Sunoco Logistics also operates Mariner South, a new 5.8 mta LPG export terminal in Nederland, Texas in tandem with Lone Star NGL.

Ineos is the first of a number of chemical manufacturers that have decided to utilise competitively priced US ethane as feedstock for their European petrochemical complexes. The company is chartering eight Evergas semi-pressurised fully refrigerated (semi-ref) gas carriers of 27,500m³ being built in China to handle the transport. Cargoes are being shipped from the Sunoco Logistics Mariner East terminal near Philadelphia to Ineos ethylene crackers at Rafnes in Norway and Grangemouth in Scotland.

Warsash Maritime Academy is the second establishment to join SIGTTO under the Society's new training providers membership category. Part of Solent University, Warsash pioneered the use of simulators during the 1970s and amongst its liquid cargo operations simulator (LICOS) offerings is *LNG Cargo Operations - Management Level*. This course follows the syllabus set out by SIGTTO in its suggested LNG competence standard (Second Edition 2008) at the management level.



Andrew Clifton (right) presents a certificate of membership to Nigel Hare, head of maritime professional development at Warsash

Headquartered in Kuala Lumpur, the Malaysian capital, **Wilhelmsen Ship Management (WSM)** is a provider of third party ship management services on a worldwide basis. The company boasts a portfolio of more than 450 vessels, including LNG and LPG carriers, and 11,000 active seafarers. In December 2015 WSM formed a joint venture with Aurora LPG for the technical management of Aurora's very large gas carrier (VLGC) fleet. Aurora LPG owns three 82,000m³ vessels and this year will take delivery of six 84,000m³ newbuildings from Hyundai Heavy Industries.

Flex LNG has two 174,000m³ LNG carriers under construction at the Samsung Heavy Industries yard in South Korea. Both are due for delivery in the first half of 2018.



US Coast Guard ready for rising gas carrier traffic

The loading of the inaugural commissioning cargo at the Sabine Pass LNG terminal in Louisiana in recent weeks - the first LNG export shipment from the continental US - provides a timely reminder that gas carrier traffic is poised to figure prominently on the US Coast Guard's radar in the years ahead. The country's rich shale gas resources are set to support growing exports of liquefied gases such as LNG, LPG and ethane.

For over two centuries the USCG has ensured the safety of mariners, waterways, vessels and waterfront facilities; protected the marine environment; defended the country's maritime borders; and saved those in peril, earning itself the sobriquet "America's Maritime Guardian" and its motto "Always Ready". With nearly 42,000 men and women on active duty, the Coast Guard carries out responsibilities touching on almost every facet of US maritime activity.

"Of the 11 missions that the USCG is obliged by law to fulfil," points out Commander Jason Smith, chief of the Coast Guard's Liquefied Gas Carrier National Center of Expertise (LGC NCOE), "it is the mission to ensure maritime safety, marine environmental protection and coastal security that provides the agency with the port state and flag state jurisdiction to regulate US-flag vessels and foreign vessels operating in US waters. In these various capacities the Coast Guard conducts some level of design plan review in advance of arrival or operation; onboard inspection and verification; and security checks to protect the vessels and the port."

The Coast Guard established its LGC NCOE in 2009 to concentrate and coordinate its gas shipping expertise. While the focus initially was on foreign and domestic-flag vessels and barges carrying liquefied gases in bulk, the Center's expertise now also encompasses liquefied gas facilities, commercial ships that utilise LNG as fuel and LNG bunkering operations. Irrespective of the specific function, LGC NCOE is charged with keeping all stakeholders prepared to comply with current and future requirements.

The Center's gas shipping experts serve as in-house consultants to the USCG, providing both internal and external technical advice and maintaining and enhancing the agency's collective competency in engaging with the gas shipping industry.

"LGC NCOE also works closely with equipment manufacturers, ship and facility owners/operators, class societies and safety-focused industry organisations such as SIGTTO," adds Commander Smith. "Such



The US Coast Guard's first LNG as Fuel Workshop, held in Houston in September 2015, included presentations by many SIGTTO members and a technical visit to Conrad's Orange Shipyard

liaison both supports the project needs of these interests as our "customers" and facilitates training opportunities which keep USCG personnel up to date with this complex, technical and often misunderstood industry.

"When it comes to gas shipping, the Coast Guard and SIGTTO are both committed to ensuring the safe waterborne transport of liquefied gases, and using guidance, partnerships and training to accomplish this. For this reason the USCG and SIGTTO signed a Mutual Training Agreement in 2013 to formalise their shared values and mission."

Over the past year LGC NCOE has established a LNG as Fuel Workforce Development Committee that has produced recommended checklists for field inspectors and is currently working on a qualification process for various types of inspections new to the USCG's workload. The Center has also just finished *Foreign Gas Carrier Examination Tactics, Technique and Procedures*, a new 225-page USCG recipe book on how to conduct a foreign gas ship inspection.

Other recent accomplishments by the Center include the implementation of bimonthly liquefied gas webinars and the staging of a Liquefied Gas Technical Seminar for Engineers, a Liquefied Gas Senior Executive Forum and a LNG as Fuel Workshop. The meetings were held with the help of industry and sister organisation partners like SIGTTO and many of its members.

"The US Coast Guard's close relationship with SIGTTO has flourished since the signing of Mutual Training Agreement," explains Commander Smith. "Over the past year SIGTTO has provided technical advice during the preparation of the *Foreign Gas Carrier Examination Tactics, Technique and Procedures* document and co-sponsored the agency's three-day Liquefied Gas Senior Executive Forum in December

2015 in Houston where over 280 USCG and non-USCG leaders participated.

"I commend SIGTTO's 35-year history and its members who have worked to maintain the gold standard in shipping liquefied gases," concludes Jason Smith. "The industry's exemplary safety record is a testament to the Society's efforts to keep safety paramount. This is critical as we see some potential challenges ahead, not least the growth in spot market trading, the emergence of many new players, low freight rates and the need for increasing numbers of mariners. My Coast Guard colleagues and I look forward to working together with SIGTTO on many new initiatives in the years to come in the ongoing drive to sustain this industry's enviable safety record."



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