

# Horizons

News and information for the marine industry  
A Lloyd's Register magazine

## Greece

– a nation of mariners

In this special Posidonia issue, Horizons interviews eight leading Greek maritime figures who discuss the present and future of Greek shipping

### Future Fuels

LR's Global Marine Fuel Trends 2030 study which forecasts the future of maritime fuels from LNG to HFO

### Southampton Ahoy!

The build-up to LR Marine UK's exciting move to a brand-new Global Technology Centre

### The Five Factors

A cut-out-and-keep LR wall chart on the top five ways to choose your fuels!



Horizons is the journal for Lloyd's Register Marine clients and employees, delivering news and analysis on our global activities.

The Horizons team are:



Editor: Christopher Browne  
E chris.browne@lr.org  
T (0)2380 249604

Marine Communications Manager:  
Nick Brown

Design & production:  
Clever Clogs Creative

Horizons is produced by Marine Communications. Care is taken to ensure the information it contains is accurate and up to date. However Lloyd's Register accepts no responsibility for inaccuracies in, or changes to, such information.

Lloyd's Register is a trading name of Lloyd's Register Group Limited and its subsidiaries and affiliates. For further details please see [www.lr.org/entities](http://www.lr.org/entities)

© Lloyd's Register 2013

Lloyd's Register EMEA  
T +44 (0)20 7709 9166  
F +44 (0)20 7488 4796  
E [emea@lr.org](mailto:emea@lr.org)

71 Fenchurch Street, London  
EC3M 4BS, UK

Lloyd's Register Asia  
T +852 2287 9333  
F +852 2845 2616  
E [asia@lr.org](mailto:asia@lr.org)

22nd Floor, Dah Sing Financial Centre,  
108 Gloucester Road, Wanchai,  
Hong Kong, SAR of PRC

Lloyd's Register Americas, Inc  
T +1 (1)281 675 3100  
F +1 (1)281 675 3139  
E [americas@lr.org](mailto:americas@lr.org)

1330 Enclave Parkway, Suite 200,  
Houston, Texas 77077, USA



## Cover stories

### Pages 12-23

#### Greece – a nation of mariners

In this special Posidonia issue, Horizons interviews eight leading Greek maritime figures who discuss the present and future of Greek shipping

### Centre pages

#### The Five Factors

A cut-out-and-keep LR wall chart on the top five ways to choose your fuels!

### Pages 30-33

#### Southampton Ahoy!








The build-up to LR Marine UK's exciting move to a brand-new Global Technology Centre

### Pages 40-41

#### Future Fuels

LR's Global Marine Fuel Trends 2030 study which forecasts the future of maritime fuels from LNG to HFO

# Contents

Changing faces 2	3 Comment	News All the latest news and views from LR 4	
	12 Greece Focus on the future		LNG bunkering study 24
	30 Global technology centres	34 Prelude Project	
38 Aircraft carriers		40 Future fuels 2030 study	42 Thiink project Windpower for vessels
46 Human element	50 Ethane study		53 Blogs Who's saying what and why

# Changing faces

## Greeks appointed to key Lloyd's Register roles

Once again Greece and the growing number of Greek-born employees who work at Lloyd's Register feature prominently in the latest LR role changes.

Athens-born Leonidas Karistios, who until recently was an LR Senior Project Manager for new construction in China, is the new Global Gas Technology Market Leader based at Southampton.

Since joining LR in 1998, Leonidas has had significant first-hand experience of the gas technology sector. During an 11-year spell in Asia, he worked on the first DFDE LNG-carrying vessels in Korea and the first Type A VLGC in China – projects that have given him invaluable insight into the shifts and changes of the gas business and how gas technology influences ship design, construction and the quest for sustainable shipping.

Before that Leonidas held a number of operational and marine business roles at LR, including a spell at our Piraeus office. He also led the strategic development of LR's marine services in improving the energy efficiency of vessels.

Leonidas has a B Eng in Naval Architecture and a Master's Degree in Marine Technology from the UK's Newcastle University.

Another senior Lloyd's Register appointee is Spyros Anastassovitis who recently became the new Classification Manager in Fleet Services.

Spyros joined LR in 1996 and was formerly Marine Operations Manager for Greece, the Eastern Mediterranean and the Adriatic areas, based in Piraeus where he was also the Piraeus Devolved Classification Executive (DCE) Manager.

In his new role, Spyros will be Chairman of LR's Classification Executive and therefore ultimately responsible for all the Executive's key decisions.



Leonidas Karistios



Spyros Anastassovitis

## Other important LR appointments

Among non-Greek changes at LR, Sam James is the new Head of External Affairs (EA) which is part of the Southampton-based Technical Directorate. EA devises and executes LR policy with national governments, class societies, industry associations, standard-setting bodies and other major maritime and safety organisations.

Sam was previously Manager of the Statutory Support Group in Fleet Services and Global Head of Fire and Safety. In his new post, he will continue his statutory technology leadership.

Finally, in a newly-created role, Ulrich Föerster has become LR's Global Technology Leader for Materials, Components and Equipment (MCE). As part of his responsibilities, Ulrich will act as overall Product Manager for LR's marine product certification and approval schemes.

Ulrich has held a variety of senior business positions since joining LR as an engineer surveyor in 1991. His previous post was Area Manager and Business Development Manager in Asia and EMEA.

Based at LR's Hamburg and Berlin offices, he will act as overall Product Manager for marine product certification and approval schemes and make sure LR delivers a high and consistent level of service.



Sam James

# Comment

## A nation of mariners

Greek shipping is a large and special market with its own unique cultural approach. Although it is primarily a bulk carrier and tanker market – so most owners are not currently seeking dramatic innovation – there is growing interest in other segments such as containers, LNG/LPG carriers and the offshore market, which all represent a significant sign of diversification.

Owners and operators are looking for year in, year out service and continued improvements in all areas of operations. Whether it is reducing or eliminating off-hire time for more rigorous scheduled repairs and surveys, we at Lloyd's Register can support all of these key activities.

It may sound basic, but one major area where we have helped owners improve performance is in developing a better understanding of marine lubricants as it will enable them to reduce engine wear and maintenance costs and to improve efficiencies.

And while future fuels have been a major topic for owners primarily trading in ECAs, most Greek tanker and bulk carrier owners can probably afford to be patient. Lloyd's Register's Marine Country Manager for Greece, Theodosios Stamatellos, says: "Our Greek clients are interested in LNG as a fuel, for example, and, being technically astute, they want to keep up with technology and be aware of everything that's going on. There's much information to absorb as well as discussion about LNG as a marine fuel. At LR, we believe initial LNG-as-fuel developments in Greece will probably follow the pattern we are seeing – and the focus on LNG-fuelled ferries – in northern Europe.

In our role as a safety advisor, Lloyd's Register Greece is continuing to find ways to balance compliance with regulation and the need to find practical solutions. And so playing a part in enabling the Greek fleet to trade safely and efficiently with the minimum of disruption and administrative problems.

Now, more than ever, Greek owners and operators need to know what these future technology challenges mean, what will work when and with what return on investment so as to maintain, and even enhance, their future competitiveness.

And Lloyd's Register is fully committed to supporting this.

## News

### Lloyd's Register issues Class Direct app for people on the move



Lloyd's Register has created an easy-to-use application for ships' crews and marine industry personnel to access ship and fleet data where and whenever needed.

The new market-leading app based on LR's award-winning web service Class Direct will enable users on ships or otherwise travelling from one place to another to access such information as vessel surveys, classification data and fleet survey information on their smartphones and tablets.

The app's great merit is that it has been specially designed to give users the information they need from anywhere in the world and it is available on both Android and IOS operating systems.



Three-in-one: The Class Direct app on an iPhone, Android phone and Android tablet

Users can book a survey with LR, monitor and check the status of their vessels' surveys, browse the classification data LR holds for specific vessels and even create a 'favourites' list of ships.

"The app will be invaluable when an urgent matter arises and a senior officer is out of the office or during the weekend when we need to arrange a survey," said Anastasia Alyfanti, Fleet Co-ordinator of Piraeus-based Navios Ship Management.

"The mobility the app offers is great. You can quickly and easily check vessel information while on the move," said Dimitris Kainadas, Marine Engineer for Greek ship managers Thenamaris.

"The new app demonstrates Lloyd's Register at our pioneering best. Its multi-purpose functions will be an ideal aid to decision-making, route-planning and survey-checking for our clients while on the move, and support the global service delivery of Lloyd's Register," said Jo Townsend, Head of LR Fleet Services.

To sign up for the FREE app go to [www.lr.org/ClassDirectapp](http://www.lr.org/ClassDirectapp)

### LR wins its first newbuild project in Bangladesh

LR Marine in South Asia recently signed a contract for the first ever newbuild project to be built to LR class in Bangladesh.

The contract is for a passenger vessel to be built at the Chittagong-based Western Marine Shipyard for the New Zealand Ministry of Foreign Affairs and Trade.

LR carried out a shipyard assessment to determine the yard's capability to build passenger ships – as required by new construction procedures – and all the correct formalities were satisfactorily dealt with before the contract was signed. The vessel's flag state will be the Cook Islands.

With this project, LR is making its mark in Bangladesh's new construction business. The country joins a group including Sri Lanka and India where LR has recently set up new construction business. It is due to the excellent teamwork between LR's South Asia and Australasia teams. Small ship classification is seen as a significantly growing sector in South Asia.

Apart from this milestone event, LR's recent win of 14 OSVs at L&T Shipbuilding for Qatar-based Halul Offshore Services Company W.L.L. and an OPV at Goa Shipyard for the Sri Lankan Navy demonstrates LR's commitment to fostering co-operation and mutual support between shipowners, navies, designers and South Asian shipyards.

### LR launches pollution-beating EALs service

A service to help shipowners and operators monitor their vessels and protect US waters from shipborne pollutants and invasive species has been introduced by Lloyd's Register (LR).

Known as EALs (Environmentally Acceptable Lubricants), the service applies to all oil-to-sea interfaces on vessels that operate in US waters and is a requirement of the US Environmental Protection Agency's 2013 Vessel General Permit (VGP).

The service collects information on the lubricants used on individual vessels and produces a ship-specific EAL report. This helps owners and operators find cost-effective solutions by pinpointing areas of a ship that cannot be changed for technical reasons.

After the report has been issued, LR produces a statement of fact summarising the work that was subsequently carried out and stating it believes the vessel is compliant with the new requirements. EALs also helps shipowners and operators compile annual reports of non-EALs discharges.

José González Celis, LR senior environmental specialist, said: "LR is already providing this service to over 20 clients across a wide range of vessel types and we are seeing an ever-increasing interest in EALs."

For further information about the service go to [www.lr.org/eal](http://www.lr.org/eal) or contact [marine-environment@lr.org](mailto:marine-environment@lr.org).

# How Lloyd's Register's SERS played a major role in the return to safety of *Maritime Maisie*

After a collision with a PCTC, the MSI Ship Management owned chemical tanker spent three months adrift at sea with little or no prospect of a safe berth



*Maritime Maisie* (right) in The Port of Ulsan with chemical tanker *Maritime Dinar* alongside

The dangers faced by ships that are heavily damaged at sea with no prospect of safety in a port of refuge were highlighted when Lloyd's Register's Ship Emergency Response Service (SERS) went to the aid of the 44,000 dwt chemical tanker *Maritime Maisie* recently.

The tanker was in collision with the pure car and truck carrier (PCTC) *Gravity Highway* off the coast of Busan last December. It later caught fire, burning for almost three weeks and leaving the vessel severely weakened, exposing it and its 44,000 tonne cargo of hazardous chemicals to turbulent weather spells and sea swells of up to four metres high.

Repeated calls to Japan and Korea for a port of refuge or safe haven were refused undoubtedly due in part to the toxicity of the tanker's cargo. As a result the weakening vessel was held in the Sea of Japan by Japanese tugs for almost 100 days. Although it was too unsafe for LR surveyors to board and assess the damage fully, our SERS, Class and regional operations teams worked with the ship's owner and manager, MSI Ship Management, to manage and help find a solution to the crisis.

Later when the fire was extinguished our Yokohama surveyors attended the vessel offshore and examined her from a launch - as far as practicable - to confirm the salvors' reports.

"For a ship to be adrift at sea like this is very unusual and multiple teams in LR had to work together to resolve the situation. *Maritime Maisie*

was a Hong Kong flagged, Singapore owned vessel carrying a hazardous cargo, damaged in Korean waters, drifting into Japanese waters and on fire for almost three weeks. This, together with poor weather conditions, meant we had to make sure our calculations of the state of the ship and recommendations to the owner were as extensive and accurate as possible," said Wijendra Peiris, LR's SERS Team Leader.

Then in April the Port of Ulsan agreed to act as a safe haven which meant the highly sensitive task of removing the tanker's cargo could begin. "Continued exposure to seas will weaken a ship's structure and the ship was so deformed that it could have exceeded its bending moment and broken up and lost its cargo. The deck was almost destroyed and just its sides and double bottom were holding it together. So before any operation could begin, we were asked to verify the calculations of the vessel's stability and safety and whether its cargo could be safely removed," said Peiris.

## *Maritime Maisie's* bending moment

After 50 days of its three-month ordeal at sea it was estimated that *Maritime Maisie's* bending moment exceeded its estimated strength limits and there was growing concern for its structural integrity. From then on *Maisie* was in danger of breaking up if subjected to worsening weather and storms at sea. Thus its need for a port of refuge became increasingly critical.

**"For a ship to be adrift at sea like this is very unusual and multiple teams in LR had to work together to resolve the situation."**

**Wijendra Peiris, LR's SERS Team Leader**

Once the ship had arrived in port, a second MSI-owned chemical tanker *Maritime Dinar* went alongside *Maisie* and started a nine-stage ship-to-ship (STS) transfer of the cargo, overseen by the LR teams. After the STS transfer, the true extent of the damage to the tanker was assessed by LR.

Iain Wilson, LR's Regional Manager for Asia, said: "This was a prime example of marine employees across multiple countries and teams pulling together and offering considerable levels of support to a key client. As well as the work of our SERS emergency service, LR's classification department and LR teams from Korea, Japan, Singapore and Hong Kong all played a part in helping the vessel get to a place of safety."

Peiris added: "Incidents like this are becoming increasingly frequent and it is a worrying trend as there is nothing in the IMO regulations that says countries must provide refuge for ships like *Maritime Maisie*. We have already dealt with eight emergencies this year and each year are called to at least 24 emergencies and another 30 incidents that need urgent calculations."

## LR's SERS service

The Lloyd's Register SERS service was the first provider of its kind when it was set up in 1984. The first regulatory requirements for such a service were established six years later, in 1990, after the *Exxon Valdez* oil spill.

With experience of more than 250 live incidents and more than 1,000 emergency exercises, SERS has earned a global reputation as the largest as well as the leading provider of emergency response damage calculation and support services. From a vessel's early critical stages through to eventual repair, SERS provides support by evaluating technical aspects of casualties and identifying concerns and possible courses of action.

Based in Southampton, SERS' dedicated teams of naval architects and marine specialists are experienced in ship casualties and ready to respond quickly and effectively to incidents 24/7. SERS currently has 3,100 ships owned by 450 shipowners and shipmanagers. *Maritime Maisie* has been enrolled in LR's SERS programme since 2007.

## Lloyd's Register wins order for 10 PSVs with ADNOC

LR's Western European Area Marine business development team and Shipyard De Hoop have secured contracts with Abu Dhabi National Oil Company (ADNOC) for the building, classification and statutory certification of 10 Platform Supply Vessels (PSVs).

Six vessels will be built at Shipyard De Hoop at Foxhol in the northern Netherlands and four more at Shipyard De Hoop's main facility in Lobith, eastern Netherlands. The vessels will be delivered between January 2015 and November 2016.

The 66.2 metre long PSVs will be powered by a diesel-electric propulsion system comprising two azimuth thrusters in the stern and three bow thrusters. The operating company for the vessels will be ESNAAD, a member of the ADNOC group.

The orders were secured as a result of LR's longstanding relationship with Shipyard De Hoop and because we have a competent and proactive local Technical Support Office (Design Support) as well as a dedicated team of Netherlands-based surveyors.



Computer-generated image of a new platform supply vessel (PSV)

The marine new construction business generated from The Netherlands has been healthy – even during the global economic downturn. Each year more than 250 new construction projects are managed through The Netherlands. Currently, the number stands at 284 new construction projects – not surprisingly perhaps as some 425 quotations for newbuilds were made in 2013 alone.

For more information, please contact [wea.marine.bd@lr.org](mailto:wea.marine.bd@lr.org).

## LR to class world's largest civilian hospital ship

LR is classing the world's largest civilian hospital ship, the 36,600 grt *Atlantic Mercy*, for her owner Mercy Ships.

The vessel, which is scheduled to be completed in 2017, will be designed by the Finnish company Deltamarin and built at CSIC Group's Tianjin Xingang Shipyard in China. Stena RoRo will manage the construction project under the leadership of Managing Director Per Westling.

Registered under the Maltese flag, the vessel will have two hospital decks and will be fitted with 277 cabins and 641 beds. At sea the ship will be able to carry up to 500 people and a total of 950 when in port. The 174 metre long vessel will also be equipped with a school for children of the hospital staff. She will be certified as a passenger ship for long international voyages with a design service speed of 12 knots.



(l-r) LR's John Hicks; Lorenzo Perez, Mercy Ships Account Manager; Jim Paterson, Senior Vice President for Marine Operations, Mercy Ships; Donald K. Stephens, Mercy Ships Founder and President; Tim Protheroe, President LR North America – and a computerised image of the *Atlantic Mercy*

"LR Marine's global team – spanning the Americas, Europe and Asia – is very pleased to support Mercy Ships and their partners in the design, build and through life operation of the *Atlantic Mercy*, enabling this unique organisation to continue their invaluable mission and expand their reach," said John Hicks, LR's VP Global Passenger Ships and Americas Business Development.

**About Mercy Ships:** **Mercy Ships ([www.mercyships.org](http://www.mercyships.org)) uses hospital ships to deliver free healthcare services, capacity building and sustainable development to those without access in the developing world. The company works in 70 countries and uses more than 1,600 volunteers from over 45 countries. Professionals ranging from surgeons, dentists, nurses, healthcare trainers, teachers, cooks and seamen to engineers and agriculturalists donate their time and skills to support these efforts.**

## LR and Nantong COSCO KHI to develop LNG fuelled MPV

Nantong COSCO KHI Ship Engineering Co (NACKS) and Lloyd's Register China will jointly develop an LNG-fuelled 28,000 dwt type general cargo ship design, built to LR's requirements, to meet current and future environmental targets.

The ship will incorporate new propulsion systems (dual and triple-fuelled) and will meet the latest operational requirements. The design will be an evolution of NACKS' latest 28K MPV\* design.

LR will apply its risk methodology for novel technology processes, which provides a proven pathway through the complexity of the technical risk assessment. The goal is for LR to issue an approval in principle (AIP) for the new design including approval of the LNG as fuel systems.

In a ceremony at NACKS' offices, Nikolas Skaribas, LR's Greater China Marine Operations Manager, signed the JIP (Joint Industry Project) agreement on behalf of LR with NACKS President Han Chengmin.

Luis Benito, LR's Head of Global Marine Marketing, commented: "This project is the latest example of our efforts to work with key partners to develop safe, LNG fuelled deep sea ships. Assessing and addressing risk is where we really add value as we transfer five decades of leadership in LNG carrier classification into supporting the exciting opportunities offered by gas for mainstream shipping."

Goro Nishiyama, Vice President of NACKS, said: "We are focused on the development of green ship technologies, especially using LNG as fuel for merchant vessels. Co-operation with classification pioneers,

LR, and sub-vendors' knowledge, experience and research resources can be definitely shared in order to keep pace with leading expertise in this segment, and this will be beneficial for both parties involved to find a practical, feasible technology solutions fit for customers' expectations in the future."

Last year LR issued details of a 'Clean Sky' LNG fuelled bulk carrier design after completing a joint project with COSCO Shipyard Group and Greek ship operator, Golden Union.

LR is the classification society market leader in LNG carrier classification. This expertise is being shared with all companies looking to use gas as a marine fuel and LR is involved in LNG as fuel projects worldwide. LR recently completed an LNG bunkering study for the Maritime and Port Authority of Singapore, which provides a clear road map for Singapore to move from concept to reality in establishing an LNG bunkering hub.

Our latest Gas Technology Report looks at the exciting world of LNG as a marine fuel – [www.lr.org/gas](http://www.lr.org/gas).

## What is a multi-purpose vessel (MPV)?

MPVs are typically highly flexible workhorses of the world's oceans that are self-sustaining deck cranes enabling loading and discharge, including heavy lift capability in ports where shore facilities may be absent. Multi-purpose vessels are used to transport a wide range of bulk, breakbulk and containerised cargo also vehicles, machinery, project cargoes and logs.

## Built for ice and cold – new gas carrier for Sovcomflot

Russia's largest shipping company, Sovcomflot, recently took delivery of its latest LNG carrier *Velikiy Novgorod*. The 170,200 cbm ship was constructed at South Korea's STX Offshore & Shipbuilding yard and is classed by Lloyd's Register. The membrane ship is equipped with a diesel-electric, dual-fuel propulsion system comprising 2 × MAN 8L51/60DF and 2 × MAN 9L51/60DF engines.

The propulsion facility provides the LNG carrier with a highly efficient, low-emission propulsion system, especially when it is running in gas mode. It also features a high degree of redundancy. The MAN 51/60 DF engines provide multiple fuelling options.

The ship is named after one of Russia's oldest cities. *Velikiy Novgorod* has a glorious history going back to the establishment of the Russian state and the start of merchant ships travelling between Russia and Europe.

The Sovcomflot LNG carrier *Velikiy Novgorod*



Computer-generated image of a PCTC



## UECC wins contract to build two LR classed dual-fuel LNG PCTCs

United European Car Carriers (UECC), which is jointly owned by Nippon Yusen Kabushiki Kaisha (NYK) and Wallenius Lines, has signed a contract to build two LR classed dual-fuel LNG pure car and truck carriers (PCTCs).

The contract has been signed with Kawasaki Heavy Industries (KHI) and the vessels will be constructed at the NACKS shipyard in Nantong, China, which is a joint venture between KHI and China Ocean Shipping (Group) Company. Deliveries of both vessels will be in the second half of 2016.

The vessels will be 181 metres long with a 30 metre beam. Both will have 1A super Finnish/Swedish ice

class, facilitating year round trading in the Baltic area. They will be able to carry 3,800 standard size cars on 10 decks apiece. A large proportion of the cargo capacity can also be used to transport high and heavy cargo and any other cargo loaded on to Mafi trailers.

The vessels' deck configuration is optimised for current and predicted future cargo mixes. They are capable of operating with LNG fuel or heavy fuel oil and marine gas oil, providing greater flexibility and efficiency.

They are the first PCTCs of their kind to be fitted with an LNG fuel propulsion system, and can complete a 14-day round voyage in the Baltic solely using LNG fuel, including main engine and auxiliary power generation.



LR's Marine Director Tom Boardley

## Tom Boardley elected VP of UK Chamber of Shipping

Lloyd's Register's Marine Director, Tom Boardley, was recently elected Vice President of the UK Chamber of Shipping.

He replaced Marcus Bowman of the international law firm Holman, Fenwick, Willan, who succeeded Kenneth MacLeod as President.

Tom, who has been an active member of the Chamber for several years, was Chairman of the International Association of Classification Societies (IACS) until July 2013.

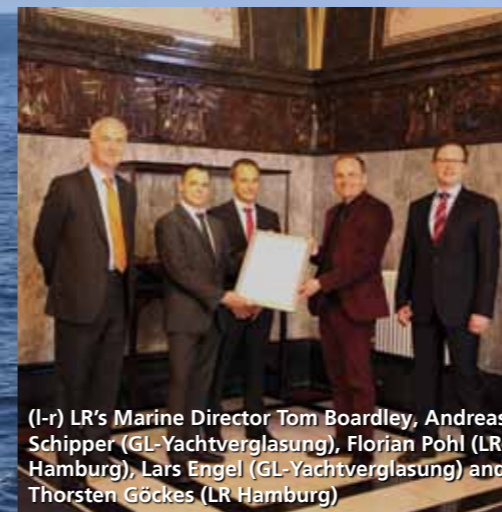
# LR approves revolutionary glass product for superyacht owners

A handover ceremony for a type approval certificate for German megayacht supplier GL-Yachtverglasung recently took place at Lloyd's Register's Fenchurch Street offices in London.

GL-Yachtverglasung delivers and installs glass for megayacht clients such as shipyards and shipowners. The company was asked to design a stronger type of glass to account for ongoing changes in yacht design and the bespoke needs of yacht-owners.

The German company approached LR as a partner for the material certification of its glass production. Following a company audit and a comprehensive range of tests, a type approval certificate was issued for a new laminated glass product known as MarineCobond. The type approval confirms its strength, its potential for use in underwater and unsheltered areas among others, and its ability to produce weight savings on a superyacht.

LR's partnership with GL-Yachtverglasung opens up the possibility of further business with shipyards and shipowners wanting to take advantage of this newly developed technology in their designs.



(l-r) LR's Marine Director Tom Boardley, Andreas Schipper (GL-Yachtverglasung), Florian Pohl (LR Hamburg), Lars Engel (GL-Yachtverglasung) and Thorsten Göckes (LR Hamburg)

# Moving with the times in Greece



Apostolos Poulouvassilis

Posidonia 2014 comes at a time when the shipping business environment is changing at a very fast pace and, even though we have some indications of global

economic recovery and much higher levels of confidence in shipping markets, there are still many challenges ahead, both in the short term and the medium to long term future, writes Apostolos Poulouvassilis.

In the current market, with low freight rates prevailing in most segments, the clear drive is for shipping to become more efficient and therefore we need to better understand fuels, engines and hull designs that can work safely, reliably, efficiently and cleanly. But safety is paramount and at the forefront of our priorities. And we must promote safety by working with owners and managers to help them improve compliance with classification and statutory requirements.

Lloyd's Register is continuously investing in innovation and future technologies and that is what we have been doing throughout the financial crisis, focusing on people skills and the application of technical capability and expertise. We recognise, through a robust

process, the importance of identifying ships that are at a high risk of falling below the standards required in the classification rules and statutory requirements and effectively helping these ships towards acceptable and sustainable compliance.

Furthermore, in support of our clients, whether they are owners, builders or manufacturers, we continue to work with regulators, flag states, industry bodies and other influencers to find ways to implement new conventions and regimes in an effective manner. Key regulatory priorities Greek owners are currently focusing on range from air emissions and Tier 3, to ballast water treatment systems and MRV, and the new CSR-H structural rules.

Therefore, at Lloyd's Register (LR) in Greece we are also continuing to find ways of balancing compliance with regulation with the need to find practical solutions and thus play our part in enabling the Greek fleet to continue to trade safely and efficiently with the minimum of disruption and administrative burden. Now, more than ever, Greek owners need to know what these future technology challenges mean, what will work when and with what return on investment, thus maintaining, and even enhancing, their competitiveness going forward. And we are fully committed to support this.



(l-r) Lloyd's Register's Marine Director Tom Boardley and CEO Richard Sadler, LR Hellenic Advisory Committee Honorary chairman Captain Panagiotis Tsakos, Theodore E. Veniamis President of the Union of Greek Shipowners and LR's Apostolos Poulouvassilis



(l-r) Lloyd's Register's CEO Richard Sadler with LR Hellenic Advisory Committee Honorary Chairman Captain Panagiotis Tsakos and LR's Apostolos Poulouvassilis.



## Shaping the future of Greek shipping – snapshot of a community confident in the face of uncertainty

*Horizons* speaks to a cross-section of Greek marine industry players who are helping to shape the future of Greek shipping. All are clearly energetic, opinionated and enthusiastic about shipping – perhaps hallmarks of Greek engagement with our important industry. Greece is now officially the biggest nation in shipping, according to Clarksons. Greek owners today boast 4,894 ships of a collective 168.9 million gt – the world’s largest fleet under the control of a single nation of owners

We spoke to a cross section of Greek shipping players, now helping to shape the future of Greek shipping. All are clearly energetic, opinionated and enthusiastic about shipping – perhaps hallmarks of Greek engagement with our important industry. And Greeks are now officially the biggest nation in shipping: according to Clarksons, Greek owners today boast 4,894 ships of a collective 168.9 million gt - the world’s largest fleet under the control of a single nation of owners.

In conversation, we explored some key themes. We are interested in what the shipping recession, financial turmoil in Greece, private equity, environmental regulations and new technology, availability of people with the right skills – amongst other issues - mean for Greek shipowners and managers. And we are particularly interested in what these forces mean by way of decisions being taken today that might shape the future of shipping. So, we asked some questions and we listened to the views of some of the leading players in Greece today.

One unifying thematic response is that of education: what is the way best to educate the shipping people of the future? And does Greek shipping have a role to play in helping Greek society find a new economic stability. After all, shipping along with tourism is the great strength of Greece.

Above all, perhaps, there is a sense that there is a solution to whatever problems may be thrown in the way of Greek shipping – and the challenges of today will be addressed and overcome. Greek shipping seems to embrace, and thrive on, adversity and uncertainty.

After all, once you know what shipping is, and what it offers, why would anyone want to do anything else?

### Solving problems is what we do

We started by speaking to John Platsidakis, Managing Director of Anangel Maritime – part of the John Angelicoussis controlled organisation – currently controlling some 105 ships in dry cargo, gas carrier and tanker fleets. Anangel is the dry bulk arm. Platsidakis is also currently serving as Chairman of dry cargo shipowners association Intercargo and is a member of the Union of Greek Shipowners Education Committee.

We immediately talk about the options available for Greek seafarers to go to sea – and whether a decline in number of Greek seafarers to come ashore might affect the future of Greek shore based ship management opening the door further to third party ship managers.

Platsidakis doesn’t think so. He feels that the crisis affecting Greece in recent years seems to have driven applications to the Greek Merchant Marine Academies and quality has improved – while the Greek flagged (as opposed to Greek controlled) fleet has remained largely stable in terms of ship numbers – “Quality has improved.” For Anangel that’s important. “For us it’s not only the monetary cost [of seafarers] it’s also about performance and that performance balances out any increased cost. We are also training our own people. Having made a €1M investment in a training facility with both bridge and engine simulators it is busy here every day – fully occupied. We know our seafarers and they know us. We think it’s important to have this close relationship with our seafarers. Knowing their personalities, their behaviours, you know how to deal with them as individuals so communications are better.”



John Platsidakis

“We consider our crews as by far the most important component of our shipping activities – our seafarers have ultimate responsibility for expensive assets, thousands of miles away from the office – no matter what you do, it’s good crews that make the difference.

“So we have a strong bond between our seafarers and the office. This is vital. The strength of Greek shipping is the hands on nature of our management... maybe there is another way,” Platsidakis muses, but it’s clear that he doesn’t see it as a way for a Greek company such as Anangel.

“What about finance”, *Horizons* asks Platsidakis. Could changing sources of equity and the people behind that money change things in Greece – private equity is a subject that anyone in shipping cannot have escaped and much of the new money in shipping is being managed by Greeks. Platsidakis: “We see private money flowing in – there is plenty of private money [looking for shipping investments]. I don’t think, though, that it is a stable source of equity.”

One of the concerns that he describes is how non-traditional shipping partners interact with Greeks who know shipping and have their own ways of doing business. Working with investors at a distance who want a say in management could cause difficulties.

“The truth is that partnerships are not easy – and you cannot change from being a committed bachelor to being married overnight! For example, ships experience problems – problems that have to be resolved from a distance in a quick way. You cannot table a board meeting for, say, the following Tuesday – when a decision about a ship has to be made now.”

## Female navigators, engineers – and management

Anangel [and sister companies Maran Gas and Maran Tankers] now have over 20 female officers on the books: one Chief Officer, 17 Second Officers, one Third Engineer and four further cadets.

How do we facilitate the career development of women in shipping? John Platsidakis comments, “Once society would have questioned the idea that women could be bus or taxi drivers. Today? Of course not! Of course there are differences – sometimes there are problems. But you have problems with all male crews as well.

“For a woman who wants to support her family and be away for long periods it is difficult says Platsidakis “but their skills are also needed ashore and so we also have the ability to provide an experienced officer with opportunities when she is keen to start a family.”

Leon Patitsas of Atlas Maritime (see interview later) strongly supports careers for women in shipping. “Men have got a lot to answer for! Maybe women think about the future more than most men do and think about what the world will look like for their children,” he says.

The clear suggestion is that maybe the male competitive drive is not enough to ensure a healthy long-term future – either for shipping or for society...The bottom line is that “we need more women in business”.

## An obsession with 'doing things better'



George Moundreas

George Moundreas, principal at NGM, third generation bulk carrier and chemical carrier focused shipowner, sitting in his offices off Passalimani in Piraeus echoes the realities of shipping that John Platsidakis returned to again and

again: problems – and how to deal with them. As Moundreas says, talking of class, “Problems will always happen, it is how you deal with them that distinguishes classification societies.”

When discussing the challenges he faces we quickly come onto crews but you sense that his clear views on this subject translate into effective business management. “There is a big correlation between the success of Greek shipping and the ability of shipowners to be surrounded by people with seafaring experience – Greek seafarers really know shipping. It is important to understand what is going on on-board the ship – from the operational side, during repairs and survey – but we need to overcome some scepticism about shipping in mainstream Greek society. “Greece does need job creation schemes and he concedes that maybe shipping would be helped if Greek society maybe had a clearer picture of what shipping is really like.

When it comes to future fuels Moundreas thinks that, “LNG is nicer, cleaner. The LNG-ready option is offered to anyone looking at newbuildings but the engine technology as well as the gas infrastructure has to evolve further. That, and the price. Everybody is considering as but no one [in the deep sea trades] is making a move for gas. It's all about economics. What's important is that everyone in our industry is becoming greener - and one thing is certain: shipping is improving its carbon footprint and will continue to evolve.

“We are obsessed with doing things better – we are looking to be at the heart of developments, following them closely in collaboration with makers, designers, shipyards and classification societies and we employ innovative solutions as part of this process but we are not obsessed with innovation. In our fleet we may take the lead in installing equipment and technology that is considered optional and we invest heavily in buying the extras – better specifications for our ships – having in mind to trade our ships for life.”

## Greeks United – shipping is the industry that can reach a common spirit in the Greek people

Perhaps the most robust and novel ideas on educating Greek shipping professionals come from the Hellenic Hull Club. Club Chairman George Alexandratos and the Club's Managing Director Ilias P. Tsakiris talked about their vision for a newly vibrant future for Greek shipping that requires better marketing of careers at sea and ashore as well as an effective shipping education.

With close to 1,000 ships from 182 companies entered in the Club and a membership that is exclusively Greek and Cypriot owners and managers, the Hellenic Hull Club can say it understands Greek shipping and that Hellenic mutuality works. “Last year we were exposed by the financial crisis in Cyprus,” says George Alexandratos. “So we called an AGM and held a ballot asking the members to decide whether they would contribute through a supplementary call to provide necessary funds. 97% said yes. This was a fantastic example of Hellenic unity.”

Having been tested by crisis and having emerged stronger, the Club is looking to further expand not just its membership but to provide more services to Greek shipping beyond hull cover. Moreover, both Alexandratos and MD Tsakiris feel strongly that shipping needs to be promoted in Greece. Tsakiris: “We have a vision to raise the status of shipping and to promote an effective shipping education – why should Greeks have to go abroad to learn about shipping when we have the expertise, knowledge and know-how right here.”



Ilias P. Tsakiris



George Alexandratos

Given the crisis, the fact that 60% of Greeks between 18-25 are unemployed, Alexandratos explains that the opportunities that shipping could offer to get out of the unemployment trap are not understood – or there are misconception about life at sea or concerns about status. “We have to explain the facts. Shipping may not be for everyone – it can be a hard life. However, right now, ashore, even if a young guy can get a job, the average monthly salary is Euro 600. But if he went to the [Marine] academy when he graduates [after 3-4 years] having earned money during sea time as well, he can expect a salary of Euro 2,700 as a second or third officer and more than Euro 3,000 as a junior engineer. If progressing at sea they could earn as much as Euro 10-15,000 per month at today's rates if they make Captain or Chief Engineer. That's good money! Or they can come ashore earlier.”

**“We have a vision to raise the status of shipping and to promote an effective shipping education.”**

Ilias P. Tsakiris, MD of Hellenic Hull Club

“But it's not just about money, either. The money is good but so are the opportunities – some will want to stay at sea. Others will have fantastic options ashore.”

“What I would like to see is a new generation involved in shipping. Shipping offers so many opportunities for an interesting life. If you want to work you will be rewarded. There is a golden opportunity for Greek shipping to train the next generation. But marketing is key – we need to market the opportunities available in shipping and then we need to provide effective training.”

Alexandratos regularly speaks to school students about shipping: “The first thing I ask is, ‘Why do you not see shipping as a potential career path?’ By asking students what they think, and what they are looking for, we can understand what we need to do to open the way to careers at sea for young Greeks. We have to put ourselves in their shoes.”

If understanding the ambitions of young Greeks is vital, Alexandratos and Tsakiris also agree that the Greeks – as a united shipping community – should also be able to provide what they need to succeed in shipping. Tsakiris asks: Why should Greeks go abroad to learn about shipping when we have the expertise here? “We are going to try to put a roof on our vision and that roof is education. Education will nurture and protect their future. We are working together with leading professionals, including Lloyd's Register in Greece, to provide the best practical education for shipping people. We need to get the best commercial, chartering, insurance, legal and technical brains in front of our young people – all, here, in Greece.”

“But”, as Alexandratos says, “We have to tell people about shipping.”

How will this be different *Horizons* asks – for many years shipping people have been saying that we need to do more to promote shipping – what will be different this time? “We need to do more than talk – we still need to talk – but more than anything we need to start doing and we need to act in a united fashion. We have worked together before. Look at the Hellenic Hull Club. Greek shipping is a hotbed of excellence – we can show the rest of Greece and the world how to do it!”

## Attracting talent to the industry

Nicolas Hadjioannou's relatively recently launched bulker company Alassia is founded on generations of experience. "Alassia's strategy of investing in high quality vessels, of offering high quality services, and of continuously improving our in-depth focused knowledge of our chosen segment remains unchanged. In fact, in a market where more 'non-traditional' shipping investors become and remain active, this strategy becomes an even more important differentiating factor than in the past.

"In an unstable business environment in the world in general and in Greece in particular, the Greek shipping community's consistent and long-term focus on creating value should continue to attract talent to the industry. Addressing the question of whether the flow of Greeks to the sea continues to diminish, will the return tide of experienced staff to operate the ships for the shore. Is this a problem? "I would separate the question between superintendent engineers and port captains, as I believe that the main source of superintendents is not ex-seafarers but rather university graduates, and I do not believe that there is or will be a shortage of young people deciding to study engineering (whether in Greece or abroad) with the goal of obtaining a superintendent engineer job in a Greek shipping company.

"As regards port captains, their job at the office is indeed very important given their sea-going experience which is unique among the executives of a modern shipping company. In addition, there is indeed a shortage of highly qualified Greek seafarers." But with only one capable port captain at headquarters needed for up to 10 ships university graduates at manager level in the Operations Department can complement the sea-going experience of port captains.

Any lack of Captains becoming shipowners in future will not be due to a shortage of senior seafarers. The reasons are more complex: "The legal/regulatory/financial requirements of setting up a good shipping company which will attract high quality personnel have increased dramatically, finance has become more scarce, and the commercial and financial viability of starting out with one small old ship has decreased significantly (and the associated risk has increased significantly)," says Hadjioannou

As to whether more Greeks could be encouraged to return to the sea as an attractive way to make a living and a life and the question of government help, Hadjiannou says that it would certainly be beneficial both at an individual level and for the Greek shipping community as a whole:

***"The main things the government can do is to reduce taxes and national insurance contributions for Greeks to make their remuneration more competitive, and to invest in seafarer training, something which the Union of Greek Shipowners has been advocating, and trying to support financially, for many years," adds Hadjioannou.***

Nicolas Hadjioannou



## Reducing the drag in shipping

When talking about energy efficiency innovations, Nicolas Hadjioannou mentions an Imabari design for a 'bullet shaped' accommodation - described by the shipyard as the 'Aero-Citadel'. It is a streamlined superstructure. Imabari reports that wind pressure during navigation will be reduced by 25-30% and that in the case of a Capesize bulk carrier, will enable a decrease of about 2% in fuel consumption. The slim, streamlined shape makes it easy to turn the bow of the ship toward windward during anchorage, and decrease the risk of anchor dragging.

All stairs are placed inside the superstructure as an anti-piracy measure, the entrance on lower level deck has thicker, reinforced steel doors. The accommodation windows are bulletproof, and water cannons are placed on the upper deck to prevent pirates entry into the accommodation.

There is a citadel facility protected by double-layer security doors which is a refuge area in the superstructure that can accommodate all crewmembers for several days. The facility is also equipped with communication devices usable even in case of blackout, ship manoeuvring equipment such as stop main engine and steering gear, and is able to gather information of the ship's data.

## George Melissanidis speaks to Horizons

### Role of Greek operators

"Greek owners have always been leaders and pioneers in the shipping industry. I don't see that changing in the near future," says George Melissanidis of Aegean Shipping Management

### Company's outlook and activities changing

"Today, the most important goal for Aegean Shipping Management is to create an energy-efficient and eco-friendly fleet. We have just taken delivery of our four, latest-generation eco tankers, the beginning of our new GreenFleet ([www.greenfleet.gr](http://www.greenfleet.gr)). These vessels have a positive impact on the environment, with a 20-30% reduction of harmful emissions.

"Aegean has implemented an Environmental and Energy Policy in our premises, and on our vessels, which includes a paperless management system, the only shipping company to have this policy in place. In addition, we train all our employees to reduce, recycle and reuse as a regular practice. Aegean Shipping Management is one of the few companies that has Lloyd's ISO 50001 energy efficiency certification.

"Another very important change in shipping is in technology. In this area we have centralised IT management on ship and shore, we use a full cloud computing environment, both on shore and at sea, and our new vessels employ a wide variety of innovative features, including wi-fi for the crew, electronic charts, and full ships' systems monitoring from the office.

***"The most important challenge for engine makers, aside from reliability, is in minimising consumption"***

George Melissanidis,  
Aegean Shipping Management



## Greek crews, Greek seafarers

"Even though there has been a reduction of Greeks entering the profession in the last decade, today we are witnessing an increasing interest from the younger generation. I believe, with the help of the State, and the support of the entire Greek shipping community, that this will continue to entice many Greeks to the profession and, therefore, the return to shore will continue, so that we maintain a strong foothold in management and ownership."

## Joint Ventures

"Each shipowner has his own requirements and priorities. The highly experienced shipowners you mention have strict criteria to follow based on their business model."

"At Aegean Shipping Management we continue to operate 'in house' and feel this is the best route for us during current market conditions. We've invested in our people and believe that their experience and expertise give us the best performance."

## Future of engines and fuel

He continues: "The most important challenge for engine makers, aside from reliability, is in minimising consumption. Today's high levels of bunker prices is a major cost for owners and charterers. Improvements in efficiency in engine design have been substantial and since there is no viable alternative to shipping, I expect that this trend will continue. Obviously one scenario for the future of marine fuels is the substitution of fuel

oil with LNG, which has a 20-30% lower price and is more environmentally friendly. However this scenario is looking at between 2020 and 2025 for more widespread implementation as there is currently no infrastructure to service such a change in bunkering. Today, there are only one or two vessels to supply LNG bunkers."

## Mapping out the future for shipping

Atlas Maritime, based in Paleo Faliro, Athens is run by fourth generation shipowner Leon Patitsas. Chief Executive Officer, since founding the company in 2004, Leon Patitsas has built the company from ground up, and successfully bought, operated and sold dry bulk, gas carriers and tankers.

Today Atlas runs a fleet of tankers and he is very much a supporter of the 'traditional' Greek style of managing ships. He is very much in favour of promoting shipping and says, "I think we need to raise the profile of seafaring as a career. We need our government to invest in our academies, look at sandwich courses and raise the prestige of a Merchant Marine education to degree level as well as providing further incentives to encourage Greeks to go to sea. We also need to improve the environment and living conditions on board ships."

"The entire world depends on seafarers – they need recognition. We need to provide a springboard to careers at sea and ashore." Paraphrasing Winston Churchill, he says, "never has so much been owed by so many to so few – 6.7 billion people depend on a million seafarers."

When asked whether he sees third party management taking root in Greece he says that he feels the oil majors appreciate the way Greeks manage tankers at the moment. "The hands-on approach and good communication with seafarers are vital factors in explaining why the Greeks have been so successful." But he says, "maybe the old model of Captain-shipowners has less chance of survival in the today's world."

At a time of change he sees a high likelihood that there will be fewer small companies and more larger ship management companies in the future and the influx of non-shipping private equity is perhaps one of the drivers for the trend to larger scale.

Atlas Maritime descends from the long history of the Lemos family begun by Leon Patitsas' great-grandfather Christos M. Lemos in 1905. He co-owned and was first master of the *Marietta Ralli*, the first steamship owned by seafarers from the island of Oinousses. In the 1970s and 1980s Patitsas' grandfather Leon Lemos, founder of Efploia Shipping, was well known for his excellent timing and innovations in bringing private equity, decades before the current tide of outside investor money, into shipping as well as encouraging employees by offering shares in vessels.

**"Never has so much been owed by so many to so few – 6.7 billion people depend on a million seafarers."**

**Leon Patitsas, CEO of Atlas Maritime**



Leon Patitsas, CEO of Atlas Maritime



The LR-classed crude oil tanker *Aspasia Lemos*

## Standing out from the crowd

Our last interview is with the renowned shipowner Evangelos Pistiolis of Top Ships. Having sold and reinvested in shipping with opportune timing, he is now dramatically branching out into the offshore drilling sector. Through privately owned Central Offshore Drilling he has invested in two JU2000E newbuilding jack-up rigs at Yantai Raffles in China with delivery in 2015 and four options for 2016 with a combined price tag in the region of \$1,3 billion.

He is the first Greek owner to look at the capital intensive shallow water rig market. The rigs will be suitable for drilling in waters of up to 400 feet in heavy duty and harsh environments. With 50% of the jack-up market built over 30 years ago, Pistiolis sees the market presenting a lot of opportunity and welcome relief from what he sees as "an overcrowded shipping market in the dry bulk market, lacking in opportunities." Adding that "In Tankers if someone knows his way around he can find good deals." ..... "Too many buyers are going after the same kind of assets – I do believe the eco story though," adds Pistiolis

Top Ships Inc was listed in July 2004 in New York, since then trades on NASDAQ ticker 'TOPS' – was formerly Top Tankers, having changed its name in 2007. In 2008 the company disposed of the majority of its fleet of 14 MR product and 14 Suezmax, double hull tankers. Top Ships is now focused on six very high specification MR Crude, Product, and Chemical Tankers - Ship Type IMO 2 at Hyundai Vinashin Shipyard, Vietnam, all with latest ECO type Main Engines.

Here are the expected delivery dates:

- Hull S406 DWT 50,000  
expected delivery 31 May 2014
- Hull S407 DWT 50,000  
expected delivery 31 March 2015
- Hull S414 DWT 50,000  
expected delivery 15 April 2016
- Hull S417 DWT 50,000  
expected delivery 31 July 2016
- Hull S418 DWT 39,000  
expected delivery 31 August 2015
- Hull S419 DWT 39,000  
expected delivery 31 January 2016

## 'Good people with the right equipment'

Pistiolis operating company, Central Offshore Drilling (COD) with a newly opened management office in Houston, will be ready to operate the rigs on delivery. 'We are building a team of some very knowledgeable oil and gas people – this is very different, and more difficult, than shipping in many ways. We haven't made it yet and we still have a long way to go. But it's enjoyable. I am enjoying the challenge!'

Pistiolis, resident of Monaco, is travelling a lot between London, Athens, USA and the Far East. When we spoke he was due to make his first trip to Houston to visit the newly established Houston office of COD. But the needs of Greek shipping are still very much on his mind. Asked about the future of Greek shipping, and where the future talent will come from, he is sanguine about the fact that there will be fewer seafarers to come ashore. "Greek shipping companies have already started adapting and training people who don't come from a seafaring background to be very good ship operators. At Top Ships we have been employing excellent graduates for many years."

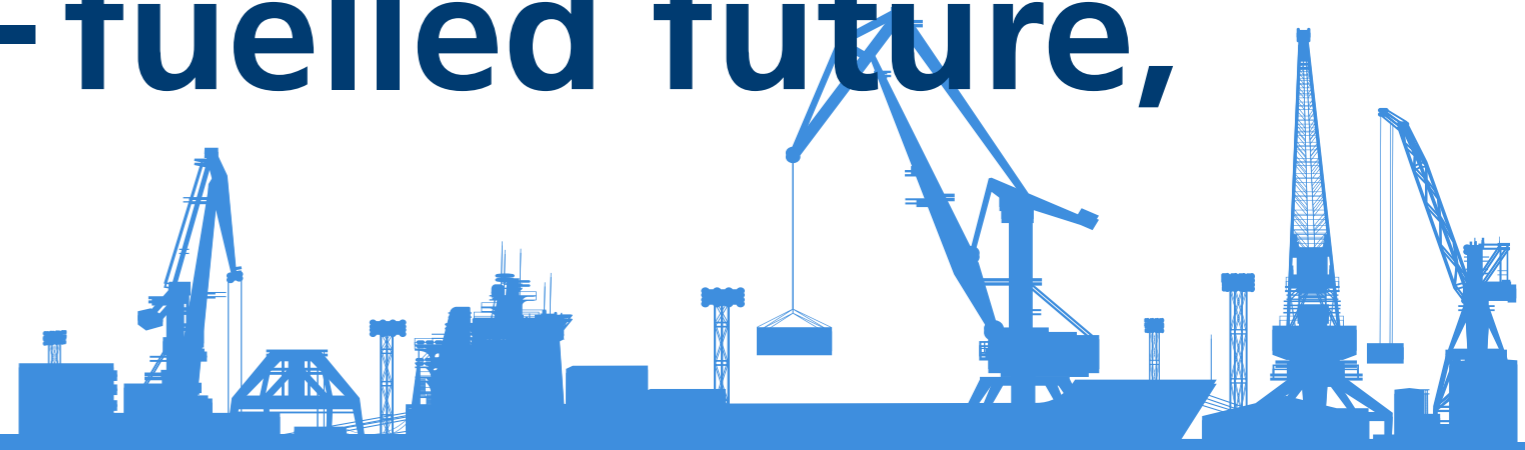
And, when asked about the Greeks uniting to educate future generations, he is cautious. "I am a pragmatist – an extreme pragmatist. It will be a very big step to get the Greeks united but I would support a genuine effort to make a difference for future generations. We can make great speeches but we then have to do the work."

**"Greek shipping companies have already started adapting and training people who don't come from a seafaring background to be very good ship operators."**

Evangelos Pistiolis, Owner of Top Ships

# Ports plan an LNG-fuelled future, says LR survey

A recent Lloyd's Register report shows that a growing number of ports are building and planning LNG bunkering infrastructure projects



Almost two-thirds of ports polled in a special Lloyd's Register survey say they are planning to build full bunkering infrastructures while three-quarters believe LNG bunkering operations will start at their port in the next five years.

The findings – which are part of LR's LNG Bunkering Infrastructure Survey 2014 – provide key insight into bunkering's global future as shortsea demand grows and the possibility of expansion into bunkering for deepsea activities increases.

The need for a full-scale LNG bunkering infrastructure has risen from a relatively low priority for ports to the second most essential driver after shipowner demand.

Pricing comes third in the survey which mainly focuses on ports in the North American and European Emission Control Areas (ECAs).

By 2020, most of the main European ports will be able to support deep sea bunkering operations, says the LR report, and 86% of the ports surveyed say it is either likely (54%) or very likely (32%) that demand for LNG will be from deepsea ships within a three to 10-year time span.

In the short term, ports will rely on third party specialist suppliers to carry gas from terminals to ships – mainly by trucks or bunker barges – the findings reveal. And, interestingly, lack of in-port infrastructure will not hamper LNG bunker delivery plans, it reveals.

The report says there is unlikely to be any significant change in bunker delivery methods for now – i.e. if HFO bunkers are currently being supplied by barge it is expected LNG will also be delivered by barge in the future.

The survey analysis which was based on 50 ports says "there is clear awareness" that port and land safety issues need to be harmonised.

Luis Benito, LR's Global Marketing Manager, says the report shows ports are getting ready for gas. "Ports want to be gas capable – and they are planning for a gas fuelled future. It seems the obvious challenge is availability at a competitive price. Will gas markets provide fuel that shipowners will buy? We believe that ports can make LNG available safely – but at what price? That's what everybody wants to know."

Latifat Ajala, LR's Senior Market Analyst, says: "Now we can clearly see that the development of bunkering capability is going to be a vital driver for take up of LNG by deep sea shipping. Traditional bunkering ports will need to be able to offer gas just as they offer the traditional choice of fuel oil or distillates today."

"Most LNG fuelled projects seen so far are very short haul, point to point trades where the operator can secure and control gas supply regardless of the global bunkering market's inability to supply LNG. But gas can only really take off if supply is more like orthodox bunkering arrangements."

"Real expansion requires infrastructure and delivery capability. It is clear that ports are planning to develop the infrastructure and capability."

**"By 2020, most of the main European ports will be able to support deep sea bunkering operations."**

You can download a copy of the study on: <http://go.lrenergy.org/lngsurvey2014>



Bunkering study's key drivers: The key areas covered by the survey



Cover of the LR LNG Bunkering Infrastructure Survey 2014



A work in progress...  
photographs of the near-complete Southampton GTC



## University of Southampton's science and engineering festival

LR's Senior Structures Specialist Joanna Mycroft discovered a new skill recently - stallholding - and was only too happy to write about it. Here's Joanna's blog.

I am a true believer in the saying that children are our best hope for the future. So when I was offered the chance to help out and organise the Lloyd's Register stall at the University of Southampton Science week, I jumped at the chance.

As the population increases and we continue to deplete our natural resources, we will need new ideas and technology to help us overcome some of the problems we will face. To counteract the destruction of the planet and new diseases and the superbugs that will appear, we will need to rely on new ideas, new ways of living and new ways of working.

These discoveries are happening all the time and there is no such thing as too young to start! The Science Week stall seemed like an amazing opportunity to help inspire some of the local children to maybe be the next greatest inventor.



LR's Joanna Mycroft, the Mayor of Southampton, Councillor Ivan White, and a young enthusiast study the effects of pressure on marshmallows to explain one of the dangers faced by scuba divers and submarines at great depths

## Marshmallows can be educational

Utilising the experiments originally designed for the University's Science Busking event on the Isle of Wight Ferry in 2013 and a veritable army of volunteers from Lloyd's Register's Global Technology Centre in Southampton we set up shop. The experiments that we had on the stall were aimed at showing the visitors a range of problems that we face every day in the marine industry, using simple items that can be found in the home.

Some of the experiments included: Using marshmallows and a bicycle pump to demonstrate what happens to items under high pressure, using yoghurt pots filled with sand to demonstrate the need for the Plimsoll Line, demonstrating stability issues with the aid of lids from bottles of washing-up liquid, using Coke cans to demonstrate the Bernoulli Effect and ship squat, and the ways melting ice can show different conductivity in materials.

All of the experiments were hands-on, with the visitors able to try for themselves and ask questions.

The day was a fantastic success. The LR volunteers on hand worked tirelessly throughout the day to explain the experiments and answer all the questions they could.

I just hope that everyone had as much fun as I did. I can't wait for the next event. And I really hope we helped to inspire the innovators and maritime pioneers of tomorrow.



## Ship to Shore: art and the lure of the sea

A major three-month art exhibition sponsored by the University of Southampton and Southampton City Council was held in Southampton recently. Christopher Browne reports

The remarkable story of Donald Crowhurst, the lone yachtsman who vanished during a singlehanded round-the-world race, was one of the highlights of a Ship to Shore exhibition held at the University of Southampton's John Hansard Gallery and Southampton City Council's SeaCity Museum.

Visitors could see the episode's most poignant feature – a hand-held radio direction finder or Navicator the English yachtsman invented and used on his ill-fated attempt to win The Sunday Times Golden Globe Race. Though the device did not prevent Crowhurst from losing his way and then falsifying his log book entries to convince the judges he had successfully been round the world.

Although Crowhurst's fate remains a mystery, a vivid photo by Tacita Dean of his trimaran which was later found abandoned near a beach on one of the Cayman Islands – and believed by locals to be haunted – was on show at the exhibition which ran for three months until early May.

Another symbol of the Sixties was a glowing aquamarine sculpture by the ubiquitous Tracey Emin, symbolising the bright neon signs organisers used to lure tourists into the amusement arcades in the seaside town of Margate, Emin's birthplace on the UK's north Kent coast.

While visitors could watch a lightshow with a difference – a display of 12 multi-coloured shards of glass by the artist Steffi Klentz. These diamond-shaped flashes of light reflected the pulses of a lighthouse as it sends out warning signals to local ships.

Equally alluring was a series of positive and negative photographs in blue and white taken inside a camera's lightbox by the artist-photographer Catherine Yass. Hopefully the signals – from the Royal Sovereign Lighthouse in the Eastbourne, UK – helped to save three rowers in a currach (an Irish rowing boat made of animal

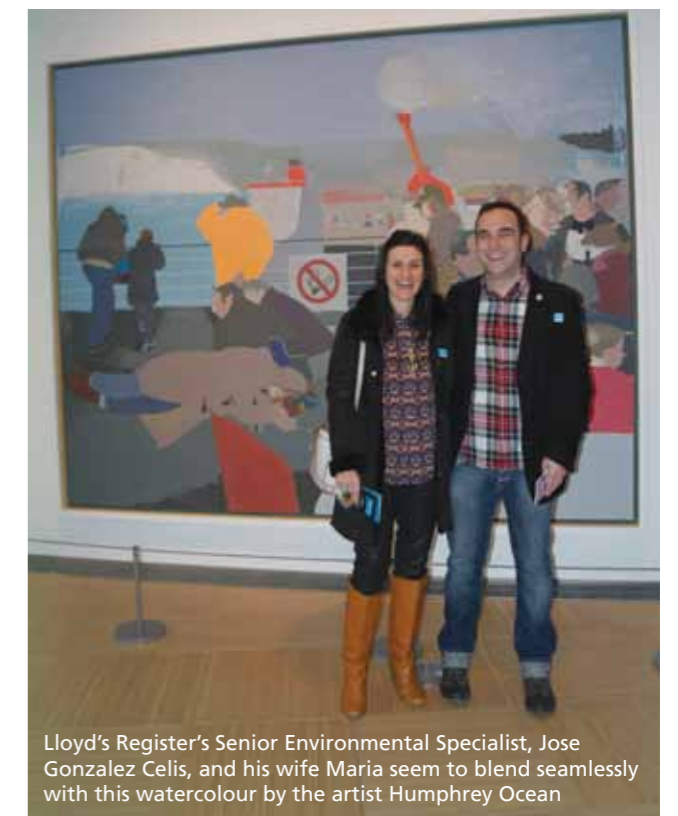


Word power: A sculpture by the artist Tracey Emin

skins and wood) as they struggled to combat a storm at sea in a video-in-a-teacup by the artist Dorothy Cross. A storm in a teacup, perhaps!

To add a final touch of realism to the event, a series of UK Admiralty charts of the Aegean and Mediterranean Seas, catchily titled "Cousteau in the Underworld", was used by artist Simon Patterson to document the life and adventures of the ocean explorer Jacques Cousteau.

The exhibition gave a group of art-lovers from Lloyd's Register many intriguing glimpses of the past and future of the oceans. It was a timely way to reflect the ideas, research and invention the new Southampton GTC will create.



Lloyd's Register's Senior Environmental Specialist, Jose Gonzalez Celis, and his wife Maria seem to blend seamlessly with this watercolour by the artist Humphrey Ocean



# Countdown to the

First it was Singapore, now it's Southampton. The 400 members of Lloyd's Register's UK Marine team are moving into a brand new, purpose-built development on the campus of the University of Southampton later this year. Here is a progress report on these two exciting ventures



The postmodern spiral staircase at Southampton GTC

Hot desking, breakout areas and giant smartboards. These are just a few of the concepts we've been told to expect when we move into our new Southampton headquarters later this year.

But then that's progress for you. The logistics of moving almost 400 employees from London to a temporary and then permanent base on the UK's South Coast is down to plain, old-fashioned planning. And we're nearly there!

Lloyd's Register's new Southampton Global Technology Centre was topped out at the end of 2012 when LR's CEO, Richard Sadler, laid the foundation stone of this handsome, Wates-built development. Professor Don Nutbeam, Vice-Chancellor of the University of Southampton, our trading partner in the whole enterprise, said the marine and maritime expertise at the new HQ would be "unparalleled" in the UK – if not the whole world.

And no one but no one could have predicted the sheer pace of change and invention in the various maritime sectors since a group of businessmen first pondered the idea of a classification society for ships in a friendly London coffee-house in 1760 – 254 years ago. Our 2014 move to a purpose-built technology centre at Boldrewood on the campus of the University of Southampton is one of the biggest, if not the biggest, landmarks in LR's history.

At the same time, LR has been a shipping sector pioneer in Singapore with a GTC collaboration with A\*Star (the Singapore-based Agency for Science, Technology and Research). Like Southampton, the Singapore GTC was set up to research and develop solutions for the energy and marine sectors.

Estimated to be worth £2 trillion, the shipping industry and its global networks supply almost all the food, energy and resources needed to sustain the planet. Lloyd's Register's two global technology centres both reflect and build on this extraordinary success story

# Big Move

Southampton



During the Singapore GTC's initial five-year programme, PhD students are being trained on site and working with up to 150 full-time engineers and researchers on R&D projects between the GTC and Singapore's Institutes of Higher Learning such as the National University of Singapore and Nanyang Technological University and many others.



A bird's eye view of the almost finished Southampton GTC

Among recent projects of note are two joint laboratories – or Joint Labs – set up with A\*Star's Institute of High Performance Computing (IHPC) at the GTC's Fusionopolis base.

The first Joint Lab was opened in 2013 and the second in March this year. Both are developing computational fluid dynamics (CFD) and engineering techniques such as numerical modelling using CFD tools, wave-in-deck impact analysis on offshore structures, floating offshore wind turbines operating in deep waters and new virtual wave tank and deep ocean basin capabilities.

LR's Claus Myllerup, the GTC's Senior Vice President for Energy Technology, said at the 2013 opening that the GTC will combine R&D activities and ideas from 48 Lloyd's Register Foundation-sponsored academic and technical institutions. "Such a great global network not only enables us to acquire vast global knowledge and expertise, but also remain sufficiently versatile to act locally," he said.

Guest of honour at the 2014 opening, David Willetts, the UK's Minister of State for Universities and Science, said: "This new partnership symbolised in the Joint Lab has the potential to catalyse our countries' [the UK's and Singapore's] reputations as international maritime hubs, translating to a wealth of economic opportunities in Asia Pacific and beyond."

The Singapore GTC's impact is certainly timely. Latest statistics show that the island republic's marine and offshore industries have grown significantly over the last few years, recording an output increase of more than 30% from 2006 to 2011, and contributing to 5.8% of Singapore's manufacturing output.

[You can read comments about the two GTCs by leading industry figures on the next page.](#)



LR team at the opening of the second Joint Lab at the Singapore GTC: Yanling Wu, Senior Specialist; Johan Gullman-Strand, Senior R&D Manager; Fai Cheng, Head of Strategic Research, Southampton GTC; James McCallum, CEO of Senergy; Claus Myllerup, SVP Energy Technology; Chris Chung, General Manager, Singapore GTC; Tim Kent, Technical Director, Southampton GTC

# Countdown to the Big Move

*"It's about giving thought to what will be on the agenda in five or 10 years' time, and giving people the space to think so far ahead requires the environment that this new initiative will create."*

Professor Ajit Sheno, Director of the Southampton Marine and Maritime Institute (SMMI) at the University of Southampton.



*"Technology and the needs of the marine industry are moving faster and faster, and the ability of any organisation to keep up is somewhat stretched, so the best approach is to collaborate with others. Being involved in the early stages of technology's conceptual development is crucial, and where better to do that than alongside a university."*

Tim Kent, Marine Technical Director, Lloyd's Register



*"Building on our Global Technology Centre in Singapore, this partnership means we are better equipped to deal with tough environmental challenges and tackle issues core to the survival of our industry and the world it supports."*

Richard Sadler, CEO of Lloyd's Register

*"Fast-moving technology means that it's a challenge to keep track of ship design. Not all shipowners have sophisticated in-house technical support, and it can be confusing when they see lots of regulation and really exciting opportunities and technology to improve performance. So they come to Lloyd's Register."*

Joanna Townsend, Head of Fleet Services, Lloyd's Register



*"Seeing a significant shipowner like Shell make such a substantial commitment to a partnership with a university is both encouraging and exciting."*

Tom Boardley, Marine Director, Lloyd's Register



*"Shell is firmly focused on contributing to world class academic research and cutting-edge technological development for the maritime industry. Our recent sponsorship of a Professorial Chair for Marine and Maritime Technology at the University of Southampton underlines this commitment... The creation of Lloyd's Register's Global Technology Centre at the University of Southampton is good news for the industry."*

Dr Grahaeme Henderson, Vice President, Shell Shipping & Maritime



Photograph showing the exterior of the Southampton GTC as it nears completion

# A prelude to great things

**Lloyd's Register Energy's (LRE's) Overarching Project Manager, Daryl Attwood, saw the Shell *Prelude* FLNG substructure launch at the end of last year. It was a proud moment and well worth the 5am wake-up call. Daryl shares his insight into this remarkable project, which is advancing energy and marine innovation**

At almost 500 metres long, *Prelude*, Shell's floating liquefied natural gas (FLNG) facility, will be the world's largest floating facility. It will be installed off the northwest coast of Australia in the Browse Basin and is designed to operate without dry-docking for the first 25 years of its expected 50-year operational life.

"At dawn on a beautiful morning in late November 2013, *Prelude* achieved the major milestone of its substructure being launched at Samsung Heavy Industries' (SHI's) yard in Geoje, South Korea. Staff, family and friends of all major *Prelude* stakeholders were delighted and proud at the sight of the result of their hard work leaving the dry-dock and floating across the bay to its new home, where topsides installation and commissioning will continue," said Daryl Attwood, Lloyd's Register Energy's (LRE's) Overarching Project Manager, who was joined by many other LR personnel from around the world for the launch.

LR is responsible for classification, certification and validation for *Prelude*. The substructure and turret have been designed, and will be constructed, in accordance with LR Energy's Floating Offshore Installation at a Fixed Location (FOIFL) Rules. The topsides will be certified according to an agreed set of industry codes and standards.

The combination of this compliance will lead to the entire vessel being taken into LR classification. LR will also confirm that the entire vessel complies with Shell's design and engineering practices (DEPs) and a set of performance standards (PS) defined by Shell within its safety case document.

## A truly global project

Design appraisal for *Prelude* was conducted at the locations most convenient for the project. Appraisal of topsides took place in the UK, close to the engineering contractor, Technip, in Paris; the turret also, in the UK, close to engineering Monaco-based contractor Single Buoy Moorings (SBM); and substructure in Busan, South Korea, close to the engineering and construction contractor, Samsung Heavy Industries (SHI), in Geoje.

Design appraisal of individual equipment packages was undertaken either at the office holding the direct equipment package certification contract with the local fabricator, or the next closest office capable of doing the work, which in most cases was in the country where the packages were being fabricated.

The equipment packages that were daily arriving on site in Geoje had undergone LR design appraisal and survey at offices around the world, including those in several European countries (France, Germany, Italy, The Netherlands, Norway, Spain and the UK), Japan, Korea, the United States and others. A country-based LRE *Prelude* project manager was assigned in each country where significant *Prelude* equipment package work took place, ensuring that all surveyors and design appraisal specialists in the country were familiar with the various applicable classification, certification, DEP and PS requirements.



Taking shape: Shell *Prelude* FLNG facility

## Our people

A multinational surveying team comprising some 30 technical experts has been assembled at LR's office in Geoje to survey the substructure and topsides construction and perform follow-up work on several hundred equipment packages. Several nationalities are represented in the team, with the majority of the substructure surveyors Korean's [see <http://blog.lr.org/2013/09/how-i-achieved-my-dream-job/>] while the project management and topsides surveyors hail from the UK, Ireland and Canada.

A dedicated LR team was also set up at Drydocks World Dubai to survey the fabrication of the turret against LR classification requirements, Shell DEPs and PS. The Dubai-based lead surveyor visited SHI in Geoje upon delivery of the first turret module and is expected to visit again when subsequent modules are delivered.

"It is a privilege to work with so many of our own dedicated teams from around the world and with the many stakeholders involved in this project. It really has been and is an exciting time," said Attwood.

## Innovative solutions

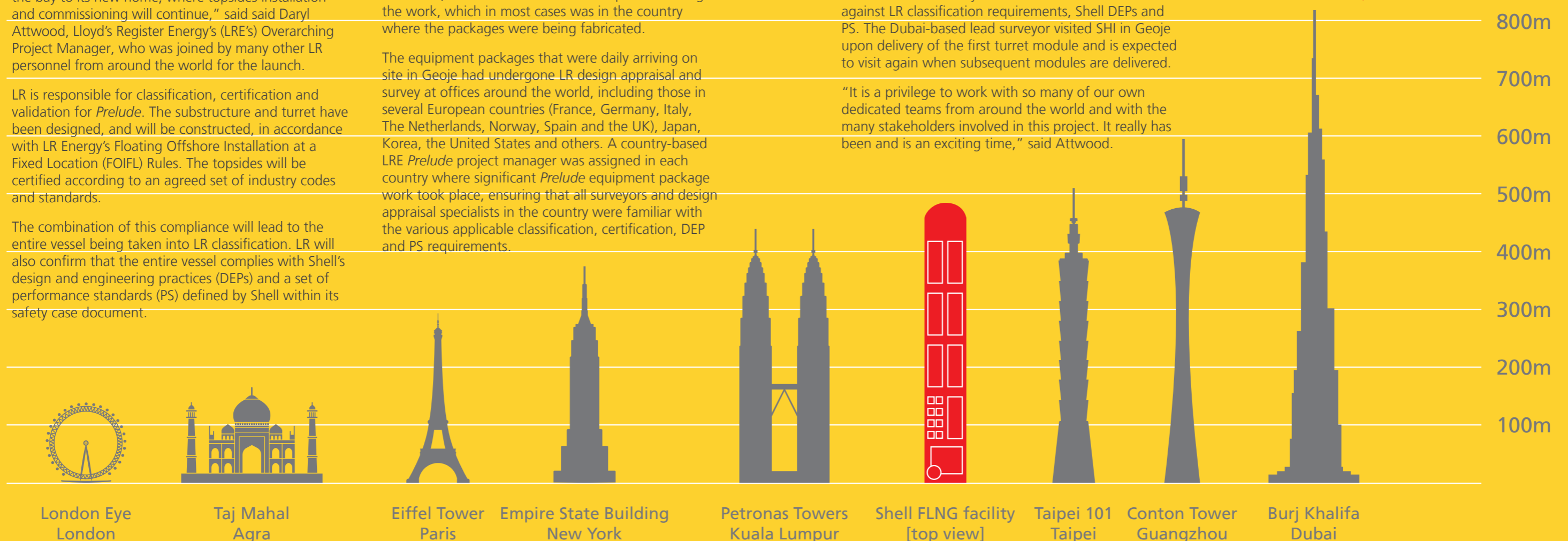
There is a saying "prepare for the world not as it is today, but for the world as it's going to be". The FLNGs of tomorrow are being designed to extract gas from new reserves in some of the world's deepest waters to satisfy society's demand for energy from sources that are 'carbon-lite'.

*Prelude* is a world-beating innovation in this area and its influence is being felt throughout LR. Two major initiatives have been extensively used on the project – an enhanced formal project management structure and formal database management of the procurement chain. These two initiatives, which have been very well received, are now being employed successfully on other major projects.

LR's technical capabilities within South Korea have improved as a direct result of the work achieved on *Prelude*. This puts LR's energy and marine businesses in a favourable position for knowledge retention and experience on future projects – integral to their safe, sustainable and economic operation.

"This growing capability can only be expected to continue as the project moves into the next phases," concluded Attwood.

How a horizontal view of *Prelude* compares with some famous landmarks





# Queen

will launch first of the UK

# super-carriers

The finishing touches: Final assembly work on HMS Queen Elizabeth

HM Queen Elizabeth is due to christen her Royal Navy namesake in July this year while the RN's second super-carrier, HMS Prince of Wales, nears completion. Christopher Browne gets a sneak preview

I've seen some giants in my time. Not just jolly green ones or scary monsters in sci-fi films, but man-made ones such as the Pyramids of Giza, the Three Gorges Dam on China's Yangtze River and the Shard skyscraper in London. But nothing in my giant-spotting career prepared me for the sight of the UK's new aircraft carrier, HMS Queen Elizabeth, looming out of the February mist on Scotland's Firth of Forth estuary.

When I visited the Babcock-owned Rosyth shipyard the vessel was nearing completion, and a huge Aircraft Carrier Alliance (ACA) gantry crane flanked the carrier's voluminous hull. With its summer naming ceremony approaching, the finishing touches were being added to the vessel's superstructure and there was a buzz of expectancy among the yard's personnel.

The ongoing contract to build HMS Queen Elizabeth and HMS Prince of Wales carriers for the UK Royal Navy is said to be one of the UK's largest single construction schemes after the 2012 Olympics and Crossrail projects.

The facts speak for themselves. The two Queen Elizabeth Class (QEC) carriers are being built at six UK shipbuilding sites – Rosyth, Glasgow, Newcastle, Portsmouth, Appledore and Birkenhead – using a workforce of at least 10,000 people, and bringing together parts, sections and equipment from a large network of manufacturers in the UK and overseas.

Lloyd's Register (LR) joined the project in 2009, and the classification contract we signed was the largest in our 254-year history. Since then, at least 18 LR managers, surveyors and specialists have worked directly on the surveys of the QEC carriers under our Naval Ship Rules. Many more have been involved with the design approval and certification of equipment and components. "By being involved from the outset our team has built up a large fund of project knowledge and given the four partners in the project, the UK Ministry of Defence (MoD), BAE Systems, Babcock International and Thales UK, a constant thread throughout," said Ian White, LR's ACA Project Manager.

HMS Queen Elizabeth will be named by the Queen on 4 July this year and floated out in August. Meanwhile, HMS Prince of Wales is in a relatively advanced stage of construction with most of the lower rings (sections) of the hull completed and much of the assembly work carried out in one of the UK's largest shipbuilding halls at Portsmouth shipyard. When the final block section of the carrier is completed at Portsmouth, it is due to be towed to Rosyth at the end of 2014 where, like HMS Queen Elizabeth, she will be finally assembled ready for her float out.

At Rosyth in February, the top deck of HMS Queen Elizabeth resembled a huge but orderly building site on a new housing estate with clusters of surveyors and shipyard workers in orange, white and blue uniforms intent on their various tasks. Most of the vessel's exterior was complete, with just a few sections on the fore and aft islands and flight deck to be added.

Inside, the carrier was a warren of passageways and approximately 3,000 compartments with the final fitments being added to the pipework and at least 1,500 kilometres of cables snaking through its cavernous interior. Two of the most conspicuous features were the huge galley and mess areas which have enough apparatus and equipment to cater for the needs of a crew of 1,000 to 1,500. The nearby accommodation area was a honeycomb of passages with row after row of cabins like the sleeping quarters of a cruise ship, and the capacious bridge was equipped with enough electronic and navigation stations for 12 Naval officers.

Although MoD protocol meant some areas were off-limits, I was able to see one of the carrier's two 36MW Rolls-Royce MT30 gas turbines being installed in the engine area. The 155-metre-long hangar deck was also near completion with rows of steel ring tie-down points fitted to the deck for securing up to 40 fixed and rotary wing aircraft. Each plane can be transferred to the carrier's flight deck in just 60 seconds on one of two giant aircraft lifts.



Team Rosyth: (l-r) LR Surveyors Lindsay Butler, Blair Anderson, Andrew Waterworth and James McClean with (centre) Project Manager, Ian White



Taking shape: the bow of HMS Queen Elizabeth

It is the project's unprecedented scope that impressed surveyor Blair Anderson, who joined LR's Team Rosyth in October 2013 after completing the Lloyd's Register Marine Graduate Programme: "The build is over a much longer period of time than my previous LR postings in new construction in the Far East so it's been good to have the time to really get to grips with the project. The timescales and the unique design also bring their own challenges of ever-increasing complexity as we near the stage of our first launch," he said.

"During my training with Lloyd's Register I have had the chance to work with a fair few naval vessel types from submarines to destroyers to landing helicopter dock (LHD) vessels but this is by far the largest naval project I have been involved with. An aircraft carrier is completely different to a commercial ship. However, with the exception of its aircraft lifts, a carrier in many ways resembles a passenger ship due to the sheer scale of everything, such as the number of cabins and the need to cater for between 1,000 and 1,500 people.

**"As with every project, coming in late has its challenges with plenty of lingo, systems and acronyms to catch up with, but with a helpful Lloyd's Register project team always at hand it has been a great start to my new job."**

Meanwhile, Wayne Thomas, LR's Lead Surveyor for Machinery at Team Portsmouth, who is currently working on HMS Prince of Wales, said: "It's been wonderful to help create such high-quality products as two aircraft carriers and to see the computer models morph into actual working warships. They are very, very complex products and unlike any other type of vessel I have worked on."



Andrew Waterworth checking a bearing on HMS Queen Elizabeth

Thomas's Portsmouth-based colleague, Mark Martin, Senior LR Surveyor for Structures and Technical Lead for Fire Safety, said: "The biggest challenge has been the sheer volume of problem-solving as the project progresses." Martin, who saw action on the frigate *HMS Avenger* in the Falklands Conflict of 1982, added: "The other challenge has been dealing with such large numbers of sub-contractors specialising in every aspect of shipbuilding from vents to pipework and fire protection."

On Scotland's River Clyde at BAE Systems' Govan and Scotstoun shipyards, assembly work on *HMS Queen Elizabeth* was completed in 2013 and the two yards' efforts are now focused on *HMS Prince of Wales*.

All structural LR surveys are complete for the *Wales*'s mid-body superblock LB03, while pipework, insulation and heating, ventilation and air conditioning (HVAC) surveys are progressing to completion and delivery to Rosyth in July this year.

Work on LB04, the largest of *HMS Prince of Wales*'s superblocks containing her generators and propulsion motors, is also at an advanced stage. Ronnie Partridge, LR's QEC Team Leader North, commented: "As expected, the superblock outfit for the second ship is further advanced than the first ship at a similar stage. Design maturity has also resulted in a significant decrease in technical queries for the LR team. However, 2014 will also see fresh challenges for the LR team on the Clyde with the transfer of the stern block LB05 and both islands (UB07 and UB14) from BAE Systems' Portsmouth yard."

Paul Marshall, LR's QEC Machinery & Fire Fighting Systems Technical Lead, said: "On the machinery/engineering systems side of things one of the main differences between the Ship Rules and Naval Rules are that the Naval Rules break the systems down into three different categories – Mobility, Ship Type and Ancillary. Each has different requirements for design, construction, installation and trials. Another difference is that the Naval Rules have additional requirements such as HVAC, Chilled Water Systems, and Made & Fresh Water Systems, etc."

***"The project is massive and all the LR team members across the various build sites interact with one another irrespective of grade or discipline, thus making it an enjoyable project to work on," added Marshall.***

QEC Project Manager Ian White, who has overseen the build since 2009, worked on the Royal Navy's Type 45 Destroyer project and managed new construction work on oil tankers and bulk carriers in several Southeast Asian yards. He said: "Looking back the contrast between the two types of project I have worked on is vast. In many of the yards in the Far East all processes are well established with knowledgeable yards and owners and often proven designs. Here in the UK this is the first of class, with a ship the size and complexity of which has not been built in this country for a long time, hence a new challenge to many, if not all, those involved."

"Also most ships are built in the one yard and not six. Aside from the technical issues I need to co-ordinate 14 surveyors across six sites while at the same time liaising with their local and the UK regional offices. Alongside this I need to deal with LR's plan approval offices, not always London or Southampton but several others around Europe, and then there are all the equipment and component offices supplying the carrier project all over the world"

"There is no previous project from which to seek guidance or ideas. You are creating processes and procedures for the first time from first principles. You can take elements that have worked on smaller and established projects but that doesn't always mean they will work on a larger one. It is the number of build locations and the duration of the project that can create LR's unique challenges! To make matters even more interesting, the contract required the use of a recognised project management tool in preference to our own survey procedures."

White continued: "LR follows the vessel from cradle to grave – from plan approval, being built under special survey and then onto through-life surveys. Together



with the design approval and the manufacture under survey of many items of equipment and components, this encompasses what class is and what value LR can bring to a project.

"On a project of this scale and with the extensive cross-section of people, companies, disciplines and processes involved, LR is one of the few common factors throughout the project. We can help provide the stability and consistency in design and quality for a complex endeavour such as this," added White.

"Like most surveyors on the project we have to operate two computers, one for Lloyd's Register and the other for the Aircraft Carrier Alliance (ACA), and hence we always seem to have double the amount of correspondence we would with one."

Finally there are the meetings! I have a jam-packed diary full of interesting topics from fire protection to blow fibre and blast doors to integrated control systems. The subject matter is vast and varied – that's a naval ship project for you.

"This contract is certainly unique in that very few aircraft carriers are built to class and this is the largest marine project undertaken by Lloyd's Register in terms of cost, duration, build locations and the number of surveyors. Because of this and the complexity of naval new construction the task of managing the project from an LR perspective is certainly daunting and at the same time challenging and one that I relish," added White.

## QEC specifications

Weight: 65,000 dwt

Length: 283 metres

Beam: 68 metres

Height: 56 metres  
(taller than the Niagara Falls)

Speed: Up to 26 knots

Engines: Two Rolls-Royce MT30 gas turbines and four diesel generator sets

Crew: 686 permanent and up to a total of 1,600 with full air elements on board

Range: 8,000 to 10,000 nautical miles

Power: Each ship will generate an output of 80 MW of power (enough to run 1,000 family cars)



BAE Systems' David Downs, Engineering Director for the ACA project, said: "The Queen Elizabeth Class Carriers are the largest warships ever to be built for the Royal Navy in the UK. It is a UK endeavour ..... employing thousands of people directly and even more indirectly through our supply chain. Lloyd's Register is fully embedded within the Build Assurance and Client teams, together ensuring the quality of the build, so *HMS Queen Elizabeth* will fulfil its purpose for many years to come and we look forward to overseeing *HMS Prince of Wales* as it reaches its final assembly stage."

# Here is your fuels forecast for 2030

A farsighted report by Lloyd’s Register and University College London looks at the future of fuels and the economic factors likely to affect shipowners and operators

After the success of our recent Global Marine Trends 2030 (GMT 2030) report, we have produced a fuel-based version called Global Marine Fuel Trends 2030 (GMTF 2030) which studies the fuels and technologies of the future.

Based on research by LR and University College London’s Energy Institute, the report explores future fuel demand for deep sea shipping. In particular the container ship, bulk carrier/general cargo and tanker sectors which together represent approximately 70% of the global shipping industry’s fuel demand.

The report shows that between a half and two-thirds of tankers, bulk carriers and container ships will still be using heavy fuel oil (HFO) in 2030, so there will need to be a major uptake in emissions-abatement technology. However, HFO’s reduced share of the market will

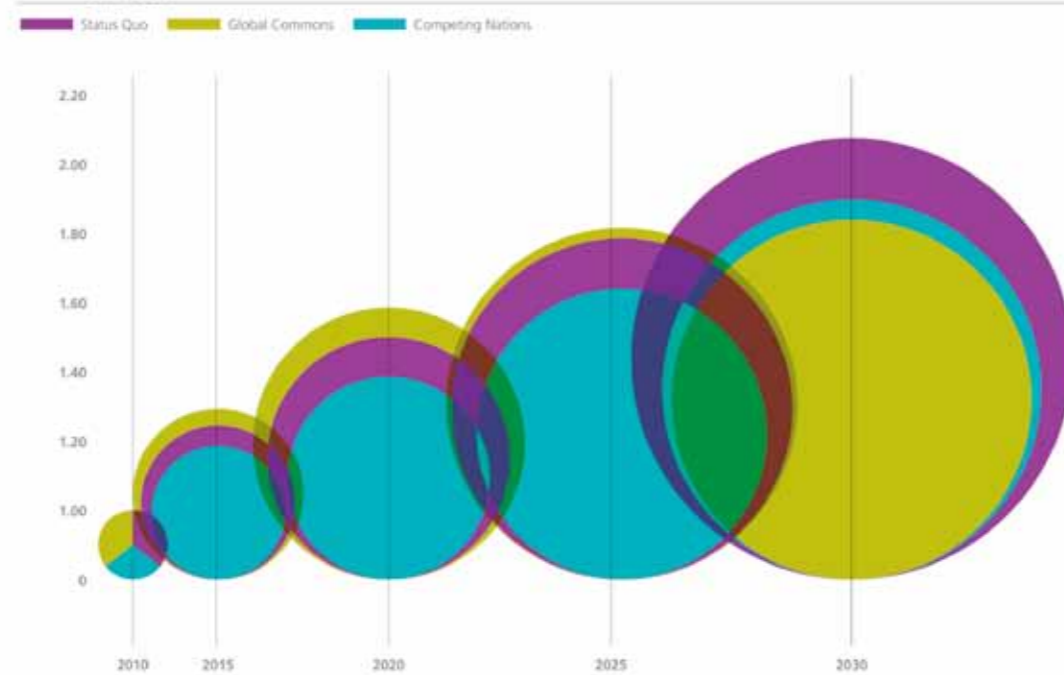
be offset by low sulphur alternatives such as marine distillates (MDO/MGO), low sulphur heavy fuel oil (LSHFO) and, of course, LNG. There’s even a scenario with hydrogen and fuel cells emerging after 2025.

“The report underlines that any transition from a dependency on HFO will be an evolutionary process,” says report project leader, Dimitris Argyros, LR’s Lead Environmental Consultant.

**“LNG is forecast to grow from a very low base to a significant market share by 2030.”**

LR’s Dimitris Argyros

Fig. 23 Evolution of marine fuel demand, relative to the 2010 baseline, for all fuels  
Source: LR / UCL



The Global Marine Fuel Trends 2030 cover

You can download a PDF of the report at [www.lr.org/gmft2030](http://www.lr.org/gmft2030).

Read our specially produced fuels matrix Wall chart for owners, operators and key industry players.

The report uses three scenarios. Status Quo implies business as usual, growth at the current rate and short-term regulatory solutions; Global Commons is characterised by greater globalisation, higher economic growth, global emphasis on environment and climate change; and Competing Nations sees more localisation of production and consumption, protectionism and a regulatory framework.



Dimitris Argyros, LR’s Lead Environmental Consultant

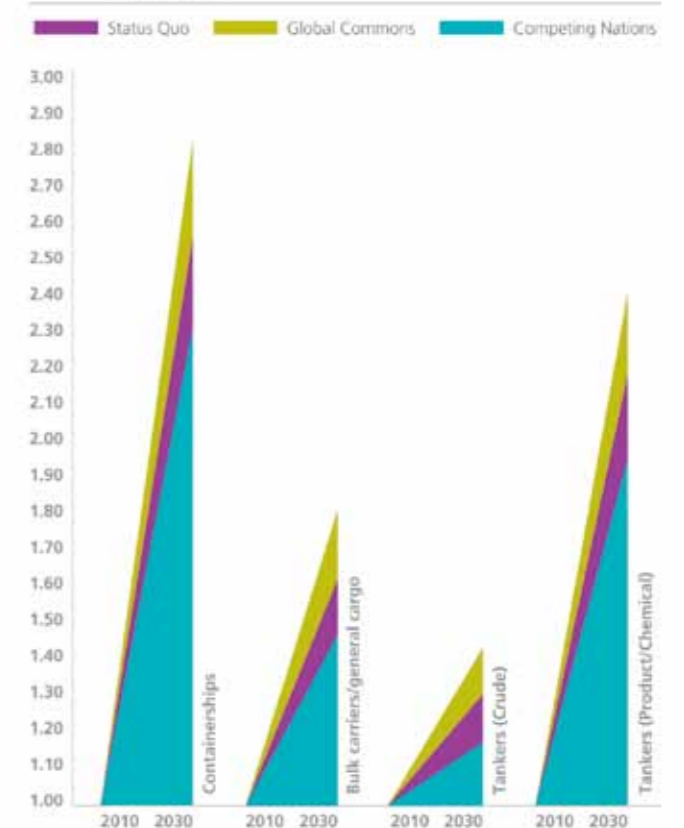
“LNG is forecast to grow from a very low base to a significant market share by 2030 – even if there is no major retrofit revolution – and most of the LNG take-up will be in newbuilds. It is important to note that an 11% share in 2030 is the equivalent in volume of about a quarter of the bunker market today. The report therefore predicts the emergence of LNG as a deep sea shipping fuel in 16 years’ time,” says Argyros.

“What we can say is the uptake of engine and alternative propulsion technology and the emergence of non-fossil fuels can only be driven by a society’s ability to create a

world with lower GHG emissions – the technology is not the barrier. Key will be policy and markets. Shipping can control its own destiny to some extent – but shipowners can only focus on compliance and profitability [which are the principles of the fuel decision-making process in the algorithms used in the report].

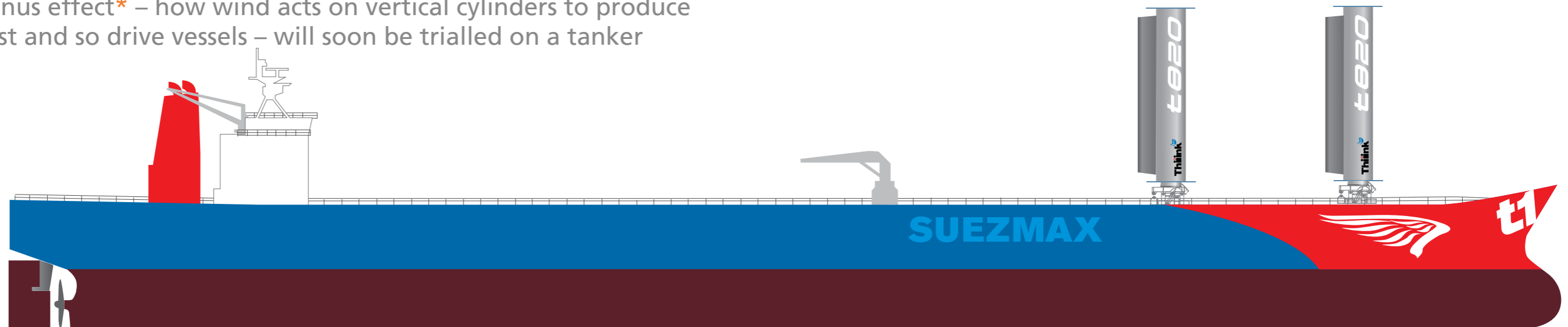
“If society wants lower GHG emissions and cleaner fuel, change in shipping has to be driven by practical regulation and market forces so that cleaner, more efficient ships are more profitable than less efficient ships with higher GHG emissions,” adds Argyros.

Fig. 4 Trade projections per ship type, relative to their 2010 baseline  
Source: LR / UCL



# Why Flettner rotors could save fuel and cut costs

A three-year windpower project based on the principle of the Magnus effect\* – how wind acts on vertical cylinders to produce thrust and so drive vessels – will soon be trialled on a tanker



Computer-generated image of a Suezmax tanker fitted with Flettner rotors

Swiss-based company Thiiink has designed a Flettner rotors concept that it plans to trial on a long-range (LR2) or Suezmax tanker early next year. "The rotors are being constructed and should be ready in early 2015," Jorn Winkler, Thiiink's CEO, told *Horizons*.

The concept is based on two 47-metre high cylinders, each with a sail flap attached, that are rigged to the deck of a tanker to provide forward thrust and so give the vessel an alternative source of power to oil-fired engines.

The Thiiink team has developed the concept over the past three years with partners Lloyd's Register (LR), a group of European engineering companies – Airbus, Huisman, Constellium, Schaeffler, Bosch, Liebherr and Walter Hunger – and an oil major, which, said Winkler, "has agreed to do long-term charters for vessels with rotors installed".

Winkler, a pioneer of another fuel-saving device known as air cavity system (ACS) technology, said: "I came up with the title of Thiiink basing it on the 3i's concept of

intelligent, industrial, innovation! Like the ACS project, the key aim of the windpower scheme is to make certain types of vessel more fuel-efficient.

"Using the wind as an alternative source of power to traditional engines gives owners, operators and charterers lower maintenance costs, greater operational flexibility and reduces the likelihood of having to use high-priced bunkers in smaller ports. It helps them to be more fuel-efficient and to find ways to cut emissions in the newly regulated Environmental Control Areas (ECAs)."

The Flettner rotors are controlled by software monitored from a vessel's bridge. They can be hydraulically folded onto the vessel's deck to be stowed in adverse weather conditions, to allow access to ports and waterways with bridges and to minimise interference with cargo loading and other port-based operations.

The rotors can be fitted to newbuild vessels and retrofitted on existing ones. They can also be moved from vessel to vessel.

On a voyage from the Cabot Strait off the coast of eastern Canada to the English Channel, the effect of Flettner rotors is calculated to reduce a vessel's main engine output by around 28%. Tests also show that the main engine output can be reduced by almost 40% if voyage planning is optimised in accordance with the Flettner rotors effect, instead of normal weather routing forecasts.

Lloyd's Register's Copenhagen Design Support Office (CDSO) has given conceptual approval to the structural and stability aspects of the Thiiink project. LR has also developed a new approval guidance document for the Flettner Rotors concept (see panel overleaf).



Valdemar Ehlers, LR Project Manager for Thiiink

Valdemar Ehlers, Lloyd's Register's Copenhagen-based Project Manager for Thiiink, said: "LR welcomes novel types of technology like this and, in the face of rising oil prices, higher chartering fees and soon-to-be-introduced emissions regulations, likes to help companies find original and cost-effective

ways to save fuel and reduce seagoing CO<sub>2</sub> and SO<sub>x</sub> and NO<sub>x</sub> emissions.

"In the past three years our Copenhagen specialists have carried out safety work and appraisal on a number of windpower concepts including Flettner rotors technology and we believe the Flettner concept shows promise and Thiiink has been using well-known and reputable partners and suppliers for its project."



Computer-generated image of Thiiink's Flettner rotors

## \*The Magnus effect

German engineer Anton Flettner added two rotating 50 foot high cylinders to a schooner in the early 1920s and created the Magnus effect to propel it. The vessel which was called Baden-Baden crossed the Atlantic in 1926 and could outsail normal schooners in moderate to heavy winds.

## Jorn Winkler biography

Danish entrepreneur Jorn Winkler has more than 15 years' experience in the shipping industry with particular expertise in large scale maritime conversion projects. He trained as a commercial pilot and worked for many years in the aviation industry including the development of unmanned aerial vehicles (UAVs) and aircraft in the USA. Winkler has also been involved with the development of manned deep ocean submersible platforms for advanced subsea exploration, which has given him invaluable insight into the combined fields of hydrodynamics and aerodynamics.

Winkler founded the DK Group which pioneered the development of air cavity system (ACS) technology. Swiss-based Thiiink and its partners have contributed €4.5 million (\$6.2 million) of development costs towards the Flettner rotors project and it is now in its final stages before its potential launch onto the market. Winkler is passionate about climate change – a cause that drives his ambition to improve the efficiency of the shipping industry.



## Lloyd's Register windpower projects

In the past three years, Lloyd's Register (LR) has been involved with a flurry of windpower projects that are striving to meet the design, technology, safety and performance criteria for wind-assisted alternative vessel power.

In 2012, we linked up with Totempower Energy Systems and Zodiac Maritime Agencies to examine the potential of wind energy for commercial ships using a wind-monitoring system on a bulk carrier. Sensors were installed on the parts of the ship where the best wind conditions could be expected for measurement of wind speed, direction and turbulence.

The same year, a consortium led by B9 Shipping and including Rolls-Royce, University College London, the University of Southampton and LR carried out tests on a model of a sail-powered concept, combining a 21st-century square rig, an automated sailing system and an off-the-shelf Rolls-Royce LNG engine fuelled with waste-derived biomethane.

"The results showed that the concept could save up to 50% of fuel on a vessel travelling on particularly windy routes against a comparable ship on the same routes," Diane Gilpin, Director of B9 Shipping.

Another company, Magnuss, has also used the Flettner rotors concept as its model, designing the VOSS™, which converts wind into forward thrust perpendicular to the direction of the wind. Like the Thiiink concept, the VOSS™ is retractable and can be stowed below deck during loading and unloading of cargo and in bad weather.

More recently a consortium of five key shipping industry players developed Windship Technology, an auxiliary sail propulsion system (ASPS) that uses fixed wing sail technology to power vessels and reduce engine power. Once again, LR gave an independent assessment of the technology and our Technical Investigation Department conducted a CFD analysis on a Supramax in varying wind speeds and directions.

***"The results showed that the concept could save up to 50% of fuel on a vessel travelling on particularly windy routes against a comparable ship on the same routes,"***

Diane Gilpin, Director of B9 Shipping



## Flettner rotor plan approval guidance

In the quest to reduce fuel costs and eliminate seagoing emissions, ship designers, operators and builders have turned to novel technologies and engineering techniques to improve vessel operational characteristics.

One of these is Flettner rotor technology which creates thrust via a spinning cylinder (rotor) and uses the force of the wind. Lloyd's Register (LR) has helped several clients with the verification of Flettner-style technologies and has produced a guidance document, *Flettner Rotor Approval Guidance*, to provide an overview of the process.

The document gives LR clients a guide to the process of the approval of Flettner rotors until such time as rules and regulations are published.

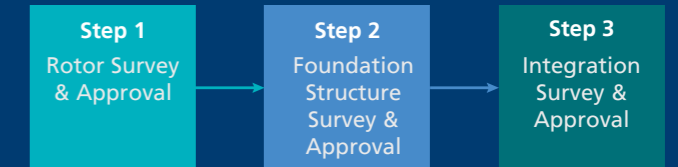
"LR's approach to the classification of Flettner rotors is based on the understanding that the rotors themselves are not essential for the safe operation of the ship, i.e. sufficient propulsion power is provided by conventional power generating plants. However, if they are to be installed on an LR classed ship, LR needs to be satisfied that they would not adversely affect the safe operation of the ship or the safety of its crew either during normal operation of the rotors or following failure," said Darshana Godaliyadde, Project Lead and Specialist of LR Marine, Engineering Systems.

Naturally, safety is paramount when installing and operating such systems. For instance, the rotors may obstruct the view from the navigating bridge. If one failed it could injure a vessel's crew members or passengers or damage the ship and its equipment.

So these elements of risk need to be assessed by means of a structured risk assessment study which LR needs to review and accept.

As part of the risk assessment, a hazard identification (HAZID) study is carried out on the Flettner rotors. The guidance document gives clients an overview of the process. The risk assessment must be carried out under LR's ShipRight procedure – Assessment of Risk Based Designs (ARBD). After the completed risk assessment report has been reviewed and found to be acceptable, approval in principle (AIP) for the Flettner rotors can be issued subject to the satisfactory resolution of any outstanding issues.

The AIP will give the client the confidence to go ahead with the design of the rotors. The following three key steps cover the approval process for the Flettner rotors:



The guidance document specifies the information that LR clients need to submit for the rotor approval, the applicable LR Rules, any additional verification criteria and also the deliverables produced at each stage of the approval process. Information on survey, inspection and testing of the rotors is also provided.

Generally, approval is issued for mechanical, structural, and electrical and control aspects of the Flettner rotor design and the deliverable will be in the form of either a design appraisal document (DAD) or machinery general design appraisal (MGDA). The attending surveyor will use the DAD or MGDA to inform the rotor survey, inspection and testing.

Since no specific LR Rules are in force for Flettner rotors, the applicable rules are derived from Provisional Rules and Regulations for Sail Assisted Ships, Rules and Regulations for the Classification of Ships, the Code for Lifting Appliances in a Marine Environment (LAME) and ShipRight procedure – Assessment of Risk Based Designs (ARBD) as appropriate.

LR aims to publish a set of Provisional Rules for Flettner rotors based on the feedback from, and success of, the guidance document.

In general, Flettner rotors can be installed on both existing ships and ships under construction. In both cases the approval procedure as described in the guidance document should be followed. And of course dedicated LR staff would be happy to assist clients to make their Flettner rotors design a success.



For more information, contact: Darshana Godaliyadde, Project Lead and Specialist at LR's Marine, Engineering Systems on [darshana.godaliyadde@lr.org](mailto:darshana.godaliyadde@lr.org)



Ergonomic design will help loading, cargo carrying and daily operations on cargo ships like this one



# Why people are the key to better ship design...

Olivia Walker, LR Senior Specialist in the Human Element, explains why adopting a more ergonomic approach to vessel design will help make ships safer and reduce sea-going accidents



The shipping industry is developing at an unprecedented pace and there is a growing awareness that the human element needs to be considered if seafarers are to operate a ship and its systems safely and effectively. .

The operational context on board ships has changed in various ways and evidence suggests that these separate developments may not be compatible. The seafarer population is changing in terms of skills and competency. Crew manning levels are reducing. The ship, its systems and equipment are becoming increasingly automated, integrated and complex. Hence there is a need to consider usability and operability. If these issues are not addressed, there may be major repercussions for the industry.

Addressing the human element is an activity that is strongly supported by senior staff in Lloyd's Register and its Technical Committee (TC).

Great technical advances have been made in ship design, and these have had a strong and positive influence on safety. Today, a smaller proportion of accidents are attributed to technical failure. However, the same cannot be said of design from an operational design, because there has been a lack of human centred thinking in the design process. Hence attention needs now to focus on the whole ship system – including the people working on board – if ship safety is to continue to improve.

### Ergonomics in class rules and regulations

One way for the human element to make a large-scale impact is to include ergonomic design requirements in classification rules. LR has adopted this strategy as a means of addressing the human element.

Ergonomic design takes account of the user early in the design process, with the aim of designing out hazards before they become risks. The approach helps to reduce the likelihood of human error, which could result in collisions at sea, groundings and even loss of life.

In 2007, LR's TC advised that the rules should begin to address ergonomics. This work started with the optional notation – Ergonomic Container Lashing (ECL). ECL focuses on designing out the hazards for port workers and vessel crews when they are securing containers.

More recent ergonomic rule development has looked at the design of control stations on vessels, and a set of mandatory requirements were approved by LR's TC in 2011.

The aim of these design requirements is to enhance operational performance, improve usability and minimise the likelihood of operator error. Introducing rules aimed at reducing the operational risks associated

### What exactly is ergonomic ship design?

Ergonomics is a scientific discipline based on understanding and enhancing the relationship between humans and their working environment. In ship design, various tools and techniques are used to improve safety and optimise human well-being and system performance.

### How would you define the human element?

The term 'human element' is used to describe the many human activities that take place in the marine industry. It includes everything from the ergonomic design of vessels, occupational factors and the training and supply of crews to organisational management.

with control station design has been a positive step forward in seeking to overcome some of the shortcomings that stem from the system complexity of today's ships.

Maritime regulations are also putting more emphasis on the human element. Until recently there was a tendency to focus on operational issues, but now there is a greater focus on design.

## "The need to address the human element in design is essential if seafarers are to be able to operate today's ships and their systems safely and effectively"

The ILO Maritime Labour Convention 2006, which came into force last year, includes ergonomic-related design requirements based on features such as accommodation, lighting, ventilation, vibration and access.

The IMO goal-based ship (GBS) construction standards for bulk carriers and oil tankers also address the human element.

In developing the new harmonised Common Structural Rules for these vessels, the human element GBS requirements have been addressed by developing



Safety first: ergonomic design should help make ship inspections easier and the number of accidents fewer

IACS Recommendation No 132 *Human Element Recommendations for the structural design of lighting, ventilation, vibration, noise, access and egress arrangements*, published by IACS in December 2013.

### Verifying ergonomic requirements in design appraisal

Surveyors are responsible for verifying any ergonomic rule requirements. If the benefits of improved ergonomic design are to be realised, the general competence of surveyors in the human element needs to increase in parallel with rule and regulatory developments.

As a first step to improving competency, LR has developed an e-learning module on the human element. This will both educate surveyors and raise awareness of the subject. The 50-minute interactive module has been specifically designed for LR's technical staff but should be of wider interest to all marine employees. Undertaking the module satisfies the human element process competency requirements within LR's marine technical authorisation scheme.

As the rules develop in specific engineering areas, accompanying human element training is being developed by LR and it is intended that these training courses will become part of the competency schemes within the specialised domains.

Ship designers tend to have little or no training in occupational health and safety or work system design so they too need industry guidance with each new set of rule requirements.

To provide a framework for consideration of ergonomics in the design of ships and equipment, LR recently produced two best practice guides to its existing publication *The Human Element Best Practice for Ship Operators*.

## "Attention must now focus on the whole ship system and take account of the people working onboard if ship safety is to continue to improve"

The new guides are *The Human-Centred Approach, A Best Practice Guide for Ship Designers and Builders* and *The Human-Centred Approach, A Best Practice Guide for Equipment Manufacturers*.

These guides describe a continuous improvement programme addressing human factors tailored to each part of the industry.

Incorporating the human element into design is essential if seafarers are to be able to operate today's sophisticated ships and their systems safely and effectively. To this end, the inclusion of ergonomic design requirements in class rules and through regulations should have a substantial impact.

The other major task is to improve the competency of surveyors and designers in the human element, which can only be achieved through awareness-raising and training.

For more information about training and the human element contact:  
Olivia Walker, LR Senior Specialist in the Human Element, on 02380 249 588 or [olivia.walker@lr.org](mailto:olivia.walker@lr.org).



# Why ethane and VLECs could be a perfect fit

Buoyed by the shale gas revolution and burgeoning volumes of ethane and ethylene, Lloyd's Register is working with industry partners on the design of a very large ethane carrier (VLEC)

The shale gas revolution in the USA – where the boom in oil and gas production from shale deposits has made ethane and ethylene available in ever-growing quantities – has prompted excitement and optimism in the shipping industry.

So Lloyd's Register's gas technology teams are producing a special report on the rise and rise of ethane and ethylene and the growing demand for new methods of ethane carriage.

Today's owners and operators recognise ethane as a key cargo for liquefied gas carriers – particularly as the volume and size of shale gas deposits uncovered in the US and elsewhere are growing by the week.

At the moment, the colourless gas is carried in small-scale, semi-pressurised gas carriers on short sea routes with latest figures from IHS SeaWeb showing there are 141 ethane and ethylene carriers worldwide with capacities ranging from 918 m<sup>3</sup> to 22,000 m<sup>3</sup>.

And the recent US revolution in ethane and ethylene production has fuelled demand for far larger, high-capacity carriers that can carry the fuel on deepsea as well as shortsea routes.

Enter Lloyd's Register. We have been working with marine industry partners on the development of a new super-size carrier or VLEC (Very Large Ethane Carrier) with a projected capacity of between 84k and 90k cbm.

Crucial to this exciting and ambitious project is the design and selection of the cargo containment systems on the VLEC – with the choice of tanks critical both for optimising the carrier's performance and also for producing the highest returns on an owner's investment.

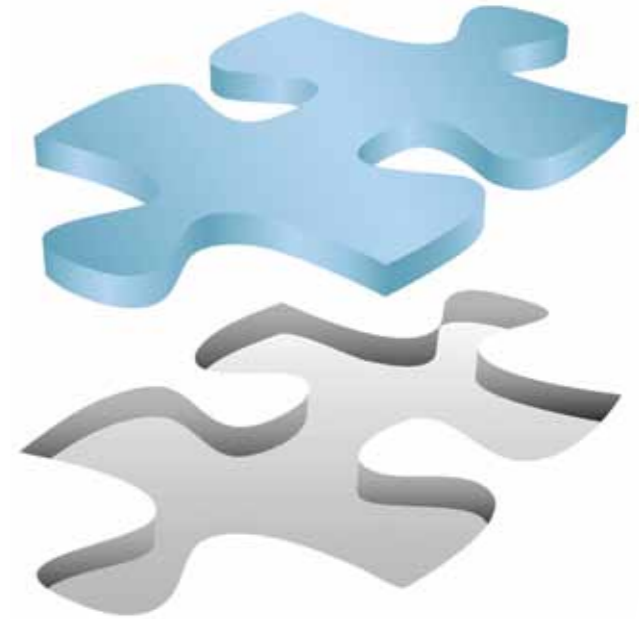
There are many possibilities which we have been analysing and assessing so they can be adapted for use on a very large carrier. Currently the two main types of system used on today's gas carriers are membrane and independent tanks.

With the membrane system, two of the most effective designs are the Gaztransport and Technigaz (GTT) No 96 and Mark III containment systems. What Lloyd's Register will need to consider with the membrane options is their limitations over partial filling and sloshing subject to the sizes and shapes of the cargo tanks. The tanks will also need to be rigorously tested before they can be adapted to a larger carrier. Once these issues have been solved, membrane will become a viable option.

There are currently three independent-style systems of containments tanks – Type A, Type B and Type C. Of the Type A option, the Aker Double Barrier Tank (ADBT) might be suitable because of its double skin arrangement ensuring that any cargo leaking from the primary barrier would be contained by the secondary barrier, independently of the hull. Lloyd's Register's preliminary analysis of the system has indicated that more project specific review and appraisal is needed before the system can be considered so as to reach general approval.

There are two Type B tank systems that are presently available and fully approved. These are the MOSS and the SPB (Self Supporting Prismatic Type B). Both require a partial secondary barrier due to leakage if the primary barrier fails. Neither is subject to filling limit restrictions and any sloshing effects with SPBs can be reduced by internal cargo tank wash bulkheads, if necessary.

Industry experience with MOSS type ships is limited to the carriage of LNG cargos which means the approval of tanks for heavier liquefied gases like ethane and ethylene will need to be carefully evaluated. As the size of the ethane-carrying tanks would be relatively small



compared with existing LNG cargo tanks, we anticipate the increase in density will not be a significant barrier to the adaptation of the tanks.

The in-service experience of using SPB tanks is limited to two vessels with aluminium cargo tanks built by IHI in 1993. Lloyd's Register has also approved the design of SPB cargo tanks using stainless steel.

While the DSME ACTIB (Aluminium Cargo Tank IMO Type B) is approved by Lloyd's Register with a cargo capacity of up to 214,000 m<sup>3</sup>, the cargo tank design would need to be scaled down for smaller capacity. At the moment new SPB designs are being evaluated using 3.5% nickel steel for the construction of the tanks. The design of the cargo tank will then be optimised for the specific cargo, ethane, including cargo tank supports and cargo tank insulation.

Lloyd's Register is currently working with a major shipbuilder on the structural design analysis for the development of a cargo tank design. So the design can be approved for compliance with LR's rules and regulations for gas carriers and the IGC Code.



Computer-generated image of a 84 k to 90 k cbm ethane carrier to meet the needs of the burgeoning ethane trade

# Lloyd's Register and ethane as a fuel

The VLEC solution prompts the possibility of burning ethane cargo as fuel, as many LNG ships with cargos of methane do nowadays. Lloyd's Register has worked with engine-maker MAN to approve the radical conversion of MAN's highly-respected ME-GI engine to burning ethane.

Lloyd's Register's extensive experience and work with flag administrations on LNG as fuel, methanol, dimethyl ether (DME), fuel cells and LPG as fuel projects makes us uniquely qualified to support the challenge of ethane as fuel.

We have issued an approval in principle (AiP) for a MAN ME-GI engine to combust ethane. MAN has delivered the documentation needed for the AiP and agreed to make the necessary design modifications to the methane version of the ME-GI.

Lloyd's Register is also seeking the agreement of flag administrations for ethane as a fuel to be carried on board a VLEC ship – as the fuel is not incorporated in the IGC.

***"I am very excited about the potential growth and evolution of existing technology to meet the challenge of trading in the ethane market,"***

The engine needs to incorporate some detailed design changes to accommodate the higher pressure (i.e. c.630 bar ethane pressure with c.66 bar seal oil pressure) needed for ethane operation. These include redesigned fuel valves, control block and piping as well as some material changes. "While these are not insignificant, the conceptual engine design and the risk management philosophy will have a very high degree of commonality with the LPG-fuelled ME-LGI engine which we have already approved," said Luis Benito, LR's Global Strategic Marketing Manager.

Of particular note for our clients is that MAN Diesel are using a HAZID exercise carried out by Lloyd's Register and MAN on behalf of a mutual client interested in acquiring the LPG variant as the basis for these changes. This HAZID is the basis for the risk management strategy of the project. "LR is therefore ideally placed to advise on the underlying assumptions and experience underpinning the risk management strategy," said Benito.



A MAN Diesel ME-LGI engine which has been approved in principle by LR for the use of ethane as a fuel

"The new VLECs will be targeted to use existing terminals that are currently capable of accommodating Very Large Gas Carriers (VLGCs) as they have similar dimensions and it would be very easy to adapt these terminals," said Benito.

"I am very excited about the potential growth and evolution of existing technology to meet the challenge of trading in the ethane market, and working with shipping industry partnerships to create safe technological solutions to make the transport of ethane safe," he added.

Forecasters predict that at the current rate of progress, volumes of methane will rise at 0.4 million barrels a day (or approximately 12 million tonnes) by 2020 compared with 2012 production. While the huge investment in ethylene capacity that is currently underway in the US will bear fruit in 2017-2018. At the same time expansion of ethylene capacity will increase substantially in Europe and Asia by 2017.

# Talking heads



Pithy! Personal! Perceptive! Here's what Lloyd's Register's top bloggers have to say about such topics as future fuels, the environment and maritime safety

## Deep thinking rather than blind faith...

"How fast will the deep sea fleet take to LNG? As interest for LNG as fuel moves beyond small domestic ferries and into international trades."

**Nick Brown**  
LR Manager, Global Marine Communications  
Blog.lr.org/author/nick-brown



## The LNG carrier fleet just keeps on growing ...

"Korea has become the second biggest importer of LNG after Japan; China has become a major importer of LNG."

**Jim Macdonald**  
Principal Specialist at Lloyd's Register Marine  
Blog.lr.org/author/Jim-macdonald



## Marshmallows can be educational...

"Some of the experiments included using marshmallows and a bicycle pump to demonstrate what happens to items under high pressure."

**Joanna Mycroft**  
Lloyd's Register's Senior Structures Specialist  
Blog/lr.org/author/joanna-mycroft



## Why EALs is a major pollution-buster ...

"With a global fleet of more than 100,000 vessels .... even minimal oil leakages can create considerable problems and harm to the environment."

**Jose Gonzalez Celis**  
LR Senior Environmental Specialist  
blog.lr.org/author/jose-gonzalez



## Improving efficiency – is it investment or just best practice?...

"Energy efficiency is a bit like investment banking – the returns you can expect are in some way directly linked to the level of investment and the risk that the investment carries."

**Paul McStay**  
LR Lead Environmental Specialist and Product Manager for Energy Efficiency  
blog.lr.org/author/paul-mcstay



## No system is perfect and risk is everywhere – probably nowhere more than in shipping ...

"Proper investigation into the root causes of accidents and near-misses will assist in the prevention of accidents and help prevent the accident happening again."

**Thomas Zeferer**  
LR Senior Marine Training Specialist  
blog.lr.org/author/thomas-zeferer





# The journey to efficiency starts here

## Here's to today's explorers.

"We wanted to explore our options to reduce our fuel costs. Lloyd's Register's technical insight and fluid dynamics modelling gave us the confidence to implement a more efficient bulbous bow, reducing fuel consumption by around 3%. We are now well into a programme on 19 ships and LR are now verifying the actual performance."

**S.S. Teo, Pacific International Lines (PIL)**

PIL's S.S. Teo with Iain Wilson,  
LR's Regional Marine Manager, Asia

[www.lr.org/fuelcosts](http://www.lr.org/fuelcosts)



Lloyd's Register  
Marine

Working together  
for a safer world

# The Five Factors

5 fuel questions that everybody's asking

Please turn over for Lloyd's Register's  
special Wall Chart



# The Five Factors

## 5 fuel questions that everybody's asking

Choosing the right future fuel strategy for your fleet has never been more crucial as oil prices rise, new emissions rules for Emission Control Areas (ECAs) are introduced and the need for lower cost methods of travel grows by the week.

We at Lloyd's Register know about fuel and can give valuable advice based on years of expertise and experience. So we have devised an exclusive and quick overview of the five key questions so often asked of a fuel.

We are looking at the fuel choices of today and a couple of niche options for tomorrow. This is aimed to help shipowners, operators and charterers take that vital first step when choosing the fuel type most likely to fit their specific fleet operation requirements.

Ultimately the decision is yours and we don't pretend we have the definitive answer. But our guide is a vital first step based on the in-depth research of our fuel specialists who have studied the options, the markets and the economic prospects.

Most operators needing to comply with an ECA-SO<sub>x</sub> – with or without compliance to ECA-NO<sub>x</sub> – will make a quick and simple switch to a low sulphur distillate fuel oil, accepting the higher price levy if their margins can take it.

Others whose margins are too tight will need the flexibility to compete. So their search for the right fuel must go deeper. And here are four key fuel options that will help you comply now and in the medium-term future.

They are:

- Residual Fuel Oil Blends
- Low Sulphur Fuel Oil which for  $\leq 0.10\%$  will be predominantly Distillates
- LNG
- Methanol (currently in the development phase).

We also mention two other potential options for owners of smaller craft operating in coastal and inland waterways.

They are Fatty Acid Methyl Ester (FAME or Biodiesel) and Glycerine – a by-product of the biodiesel production process currently being studied. A further range of fuels such as LPG, Ethane, Hydrogen and Synthetic or Renewable Hydrocarbons – among others – are currently being reviewed and, in some cases, about to be trialled.

Here our chart gives you a comparative tool to show the five key characteristics of the fuels, using low sulphur distillates as a baseline. These characteristics are based on the assumption that no exhaust gas after treatment is used as this would affect the ratios.

The five factors you need to consider when you make that key decision are:

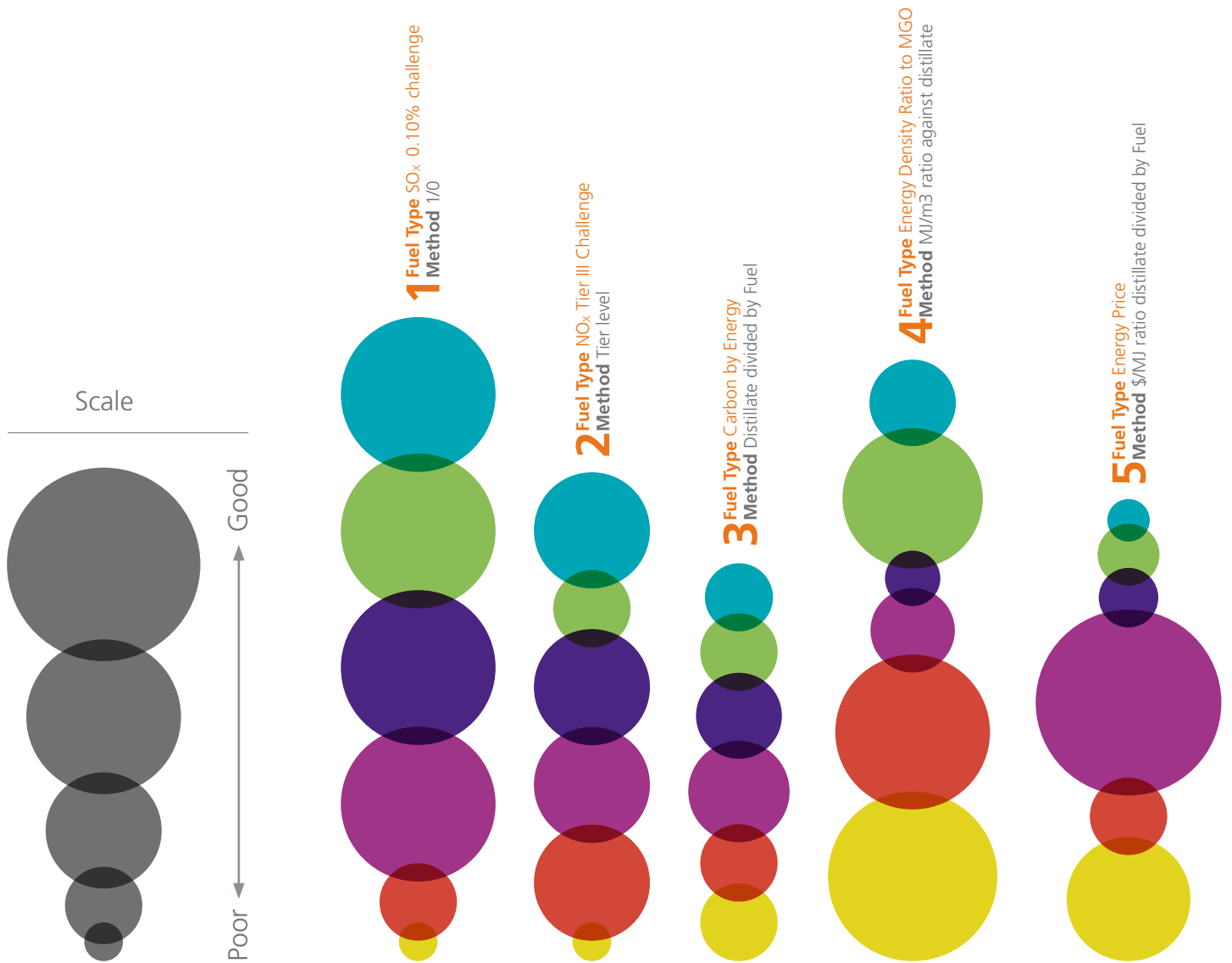
- 1 **SO<sub>x</sub> (Sulphur 0.10%)** – can I comply easily with the 2015 ECA SO<sub>x</sub>?
- 2 **NO<sub>x</sub> Tier III** – will I be able to comply if my ship is required to do so post-2016?
- 3 **Carbon by energy** – if the CO<sub>2</sub> tax comes in which will be the most beneficial?
- 4 **Energy density** – what storage volume will I need above or below that of MGO?
- 5 **Energy price** – how much more or less will it cost me than MGO?

Comparative Fuels chart on key compliance and operational factors:

- 1 **SO<sub>x</sub> 0.10% challenge**  
Can the fuel be easily supplied with  $S < 0.10$  mass % or less:  
0 = Not difficult to supply  
1 = Yes some sulphur but within required limits  
2 = Virtually no sulphur or none at all
- 2 **NO<sub>x</sub> Tier III or Challenge**  
When the fuel faces a greater challenge to meet Tier III this will be a lower rating. LNG at has a higher rating as engines using the Otto Cycle can achieve Tier III without post combustion measures
- 3 **Carbon by energy \* ratio benchmark against MGO**  
High figure is favoured; low figure is poor
- 4 **Energy density ratio MJ/m<sup>3</sup>**  
High figure is favoured; low figure is poor
- 5 **Energy price ratio MJ/\$**  
High figure is favoured; low figure is poor

# The Big Five

Key ■ HFO ■ MGO/MDO ■ LNG ■ Methanol ■ FAME ■ Glycerine



We at Lloyd's Register are here to help you make your next fuel choice. If there are any points you would like to discuss please contact the **LR fuels team** at [FOBAS@lr.org](mailto:FOBAS@lr.org) or FOBAS's Principal Specialist **Timothy Wilson** [Timothy.Wilson@lr.org](mailto:Timothy.Wilson@lr.org) and Strategic Research Specialist **Kim Tanneberger** [Kim.Tanneberger@lr.org](mailto:Kim.Tanneberger@lr.org)

**Note:** These statistics are based on a number of market sources and provide an indicative selection method. They may well change in line with market forces.



#### Acknowledgements and disclaimers

The authors would like to acknowledge the support of their colleagues and management within their organisations in developing this supplement. The views expressed in this supplement are those of the individuals of the production team and they do not necessarily reflect the views of the Lloyd's Register Group Limited (LR).

This publication has been prepared for general guidance on matters of interest only, and does not constitute professional advice. You should not act upon the information contained in this publication without obtaining specific professional advice. No representation or warranty (express or implied) is given as to the accuracy or completeness of the information contained in this publication, and, to the extent permitted by law, Lloyd's Register Group Limited do not accept or assume any liability, responsibility or duty of care for any consequences of you or anyone else acting, or refraining to act, in reliance on the information contained in this publication or for any decision based on it. This publication (and any extract from it) must not be copied, redistributed or placed on any website, without prior written consent.

All trade marks and copyright materials including data, visuals and illustrations are acknowledged as they appear in the document.

[lr.org/marine](http://lr.org/marine)

