Lloyd's Register

Issue 56, December 2020

Horizons.

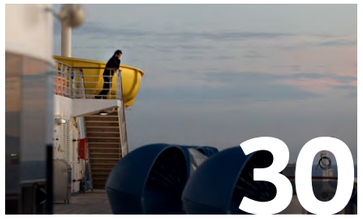
Connecting tomorrow's thinking to the challenges of today.

Decarbonisation.

Read about the launch of LR's new Maritime Decarbonisation Hub, the challenges around fuel supply chain readiness and the projected growth of offshore wind.

Sustainability.

Find out how the Sustainable Shipping Initiative's updated Roadmap aims to guide shipping throughout its sustainability journey.



Safety.

Findings from an LR survey on maritime workers' wellbeing during COVID-19 reveal important lessons for the industry.

Leadership.

Alastair Marsh shares his reflections as the LR CEO signs off on his 14-year tenure.

Digitalisation.

We examine how technology is making tank inspections safer and the latest on remote surveys.

Regulation.

A look at the new regulations that will take effect over the coming year and analysis of the outcomes from MEPC 75.

Cyber security.

The highlights from LR and Nettitude's recent cyber security webinar and a look at the best strategies to protect against cyber-attacks.

Spotlight.

News.

Catch up on the latest developments at LR from our teams around the globe.

Meet the team

In this issue, we hear from IMO Secretary General, Kitack Lim, about the importance of the shipping industry remaining united to tackle the decarbonisation challenge. New BIMCO Secretary General and CEO, David Loosley, shares his thoughts about how the resilience and innovation demonstrated throughout the COVID-19 pandemic could be applied to accelerating decarbonisation efforts. Paul Bartlett speaks to LR's Decarbonisation Programme Manager, Charles Haskell, about the launch of LR's new Maritime Decarbonisation Hub. We also take a detailed look at the findings from our seafarer wellbeing survey conducted earlier this year, and the lessons that can be learned. Nicola Good speaks to LR CEO Alastair Marsh, as he signs off on his 14-year tenure at LR. Andy McKeran, LR Marine and Offshore Commercial Director, discusses the future of safetytech in the marine industry. Viv Lebbon and Paul Carrett work with LR subject matter experts for insight into tank inspection safety and remote surveys. And, LR Group Head of Dispute Resolution and Compliance, Andrew Kennedy, explains why the findings of the French Supreme Court are welcome news to classification society surveyors. Our designer for this issue is Kaz Kapusniak.

If you have any feedback or suggestions for upcoming issues of Horizons, we'd love to hear from you. Please get in touch with Paul Carrett at paul.carrett@lr.org

Nicola Good

Paul Carrett

Viv Lebbon

Paul Bartlett

Embracing transition.

Looking to a greener future for the maritime industry.

The end of 2020 is within our sight. It has been the most difficult year for generations, with the global pandemic causing upheaval to everyone's daily lives. Yet while COVID-19 has been a negative disruptive force in countless ways, it has also accelerated some key megatrends including decarbonisation and digitalisation, bringing a sharper focus on the possibility of a green economic recovery.

For many of us, it's clear that the years ahead are a time for action. For Lloyd's Register, this means active participation in an industry wide collaboration to drive the necessary change. We all need to recognise how our ways of living affect our planet and for us, decarbonising the maritime industry is a key priority.

Transitioning our industry to net zero comes with challenges. The technology exists – we can build the ships – but we need to move from pilots and prototypes to commercially viable deep-sea vessels. It will be costly, heavily dependent on research and development and require stakeholders from across the supply chain to address the landside infrastructural requirements. For shipping to invest in zero-carbon tonnage, it needs clarity on future fuel costs and availability, as well regulatory certainty that the decisions of today won't be penalised in the years to come.

We all know that there will be multiple solutions for the industry to consider as it forges a path to a clean energy future. To support this transition, our industry needs trusted advice, information, expertise and thought leadership. This is why Lloyd's Register has launched its Maritime Decarbonisation Hub, which aims to create safe, sustainable pathways to a zero-carbon maritime industry. The Hub, a joint initiative between Lloyd's Register Group and Foundation, brings together the skills, knowledge and capabilities to help the maritime industry to design, develop and commercialise the pathways to future fuels, vessels and the operational models required for decarbonisation.

Sharing our knowledge on safety and sustainability has been core to our 260-year heritage and we are committed to support the changes facing our industry with practical, pragmatic and commercially viable solutions.

The journey ahead is unlikely to be straightforward or easy, but the agility and adaptability that has been so abundant in the maritime sector in recent months is cause for optimism. We are resilient people; we know how and when to pull together, and we have encountered similar propulsion revolutions before. We also have the fortitude and tenacity to secure this change as we know it will guarantee a better greener tomorrow for us all.

Nick Brown
Lloyd's Register Marine & Offshore Director

Dedicated Maritime Decarbonisation Hub: converting words into action.

LR's new Maritime Decarbonisation Hub will provide a platform for the acceleration and integration of industry wide initiatives, bringing together the three essential components – technology, investment and community readiness levels to provide evidence based pathways through technology demonstration projects, according to LR's Charles Haskell who will manage the new setup.

Words by Paul Bartlett.

"In order to reduce Greenhouse Gas (GHG) emissions by 2050, relative to 2008 levels, by 50% we know we need zero-carbon vessels on the water by 2030," said Charles Haskell, speaking to Horizons following his appointment as Progamme Manager of the classification society's new Maritime Decarbonisation Hub. "Now it's time to move forwards from thought leadership to action and create industry wide projects that derisk technologies and investments."

Haskell is excited by the opportunities but well aware of the challenges. "As things stand today, there are many inspiring projects in progress across shipping's various sectors. The Hub will provide a basis for closer collaboration between stakeholders and a platform for sharing the results of decarbonisation initiatives so that we as an industry continuously learn from previous projects and evolve," he explained.

"The LR Maritime Decarbonisation Hub will provide key stakeholders in the value chain with guidance at every step of their journey as they reduce the carbon intensity of their operations," he continued. "At the same time, it will offer policy makers evidence-based advice on the most efficient means of enabling and supporting this transition."

Over the last four years, LR has produced a series of papers on possible pathways for fuel transition between now and 2050 , with the support of University Maritime Advisory Services (UMAS).. Haskell has clear views on putting these theories into practice by involving technology firms, shipowners and operators, financiers, designers, builders, ports, fuel suppliers, regulators and, most importantly, shipping's end users – charterers.

"Many of these stakeholders have different aims and ambitions. That is why the role of the Hub is so important. We need to bring together these separate groups and provide a basis for them to channel their efforts, coordinate projects, and collaborate in order to achieve success," he explained.

The investment challenge

The infrastructure investment component is key, the work of industry led initiatives such as the Global Maritime Forum and the Getting to Zero coalition have moved the debate forward. The launch of the Poseidon Principles – an initiative to prioritise the environmental component in financing shipping projects – represents major advances in sustainable funding development. Haskell noted that Poseidon Principles signatories now fund about 40% of the world's commercial tonnage. A drive to expand the membership base continues.

More recently, the Sea Cargo Charter initiative was launched. Importantly, this new initiative shares the same four principles as the Poseidon project: Assessment, Enforcement, Accountability and Transparency, and aims to align chartering activities with environmental behaviour to promote international shipping's decarbonisation.

The primary challenge, however, is the supply and infrastructure that is needed to fuel zero-carbon vessels. This is where the investment is needed, and why it is important for projects moving forward to involve all aspects of the supply chain, to ensure success, and work outside of the industry with other sectors also striving to decarbonise as this will help de-risk the projects.

Customer engagement

"Today, we have a range of decarbonisation possibilities available, but shipowners are in business to make a return on capital. New technologies will not be adopted unless either forced to do so by regulation or motivated by potential return on capital. That is why charterers have such a vital role to play," Haskell declared.

Shipping's customers will be a key participant in pilot projects coordinated by Haskell and his team. They will be there to make sure that the Hub focuses on R&D that features high on their sustainability agendas. But charterers are also necessary for the accurate assessment of potential benefits from consuming transport as a service. Only

What is the Decarbonisation Maritime Hub?

The Maritime Decarbonisation Hub, a joint initiative between Lloyd's Register Group and Foundation, brings together thought leaders and subject matter experts with the skills, knowledge and capability to help the maritime industry design, develop and commercialise the pathways to future fuels required for decarbonisation. A steering group of external stakeholders is in place to ensure the hub focuses on the challenges that matter to industry.

The Hub is open to undertaking and actively seeking partnerships with stakeholders across the industry, focused on creating a more sustainable future for shipping and contributing to society's global challenge of slowing climate change.

Through collaboration, producing and sharing evidence-based research, the Maritime Decarbonisation Hub will help steer charterers, owners and operators, financiers, ports, yards, fuel suppliers and regulators among others through the technically complex decision-making and robust investment considerations they will encounter during this transition towards industry transformation.

they can gauge how costs weigh up against potential commercial benefits.

LR is already involved in research programmes along these lines. For example, a Joint Development Project (JDP) was established early this year, bringing together LR, MISC Berhad, Samsung Heavy Industries and MAN Energy Solutions to develop an ammonia-fuelled tanker design. The involvement of MISC as a proactive partner in the JDP is essential, Haskell stressed. What these projects have shown us is that zero carbon vessels can be designed and engineered. Haskell identified an important difference in this marine fuel transition compared with those that have gone before.

“In shipping’s previous energy transitions,” he explained, “there was a readily available alternative – wind to coal … coal to oil … and, to a limited extent, oil to gas. The challenge with the next propulsion revolution is that the fuel is not yet available, it will cost more, and we have significantly less time to adopt it, this is why we need a collaborative effort from all angles starting now to ensure we can achieve the 2050 ambitions.”

More impetus required

Despite the growing number of owners and operators who are making moves to adapt to more sustainable asset operation, however, there are many hundreds for whom business continues as usual, but this is not surprising given the uncertainty lying ahead, Haskell conceded. The IMO has an essential role to play, of course, but the clock is ticking, and a proliferation of regional initiatives – such as the inclusion of shipping in the EU’s Emissions Trading Scheme, for example – may now be inevitable.

“If societal feedback indicates that the pace of change is too slow, there are several mechanisms for accelerating the transition,” Haskell explained. “Since the fuels of the future will inevitably be much more expensive, there may have to be regulations to generate change based on fuel levies.”

This process will involve a new group of stakeholders – politicians and regulators – who may not be familiar with the practical workings of shipping’s global business. “That is why the work of the Hub is so important. We must be able to demonstrate evidence-based results from integrated multidisciplinary projects that have involved all of shipping’s stakeholders,” Haskell concluded.

> **The challenge with the next propulsion revolution is that the fuel is not yet available, it shall cost more, and we have significantly less time to adopt it, this is why we need a collaborative effort from all angles starting now to ensure we can achieve the 2050 ambitions.**

Decarbonisation requires an international, co-ordinated response.

The industry must remain united in working towards a truly global regulatory framework that implements the Initial GHG Strategy, according to IMO Secretary General, Kitack Lim.

Decarbonisation is one of today’s major challenges for the maritime sector, requiring an international, co-ordinated response.

The maritime sector has a responsibility to join in the fight against climate change. We simply cannot shy away from the energy transition in shipping, to meet the ambitions in the Initial IMO strategy on the reduction of GHG emissions from ships and ultimately phase out shipping’s GHG emissions.

The strategy sets out a concrete timeline for the efforts to decarbonise shipping and calls for a reduction in carbon intensity of international shipping by at least 40% by 2030; and for total annual GHG emissions from shipping to be cut by at least 50% by 2050 compared to 2008, with the aim of decarbonising international shipping by the end of this century.

In November, IMO’s Marine Environment Protection Committee (MEPC) meeting approved short-term measures to improve ships’ carbon intensity. These draft amendments to MARPOL Annex VI are expected to be formally adopted in 2021. In addition, a comprehensive impact assessment will be conducted and submitted to the MEPC next year, to provide a detailed evidence-based qualitative and quantitative assessment of specific negative impacts on States.

The package of amendments reflects the collective commitment to work towards decarbonisation of shipping. The package was a compromise borne out of long and challenging discussions. The outcome is highly important, based on hard work and solidarity over several years and establishing important building blocks, without which future discussions on mid and long-term measures will not be possible.

A great deal of work on the implementation of the measures lies ahead, but I am confident that, with the IMO community’s customary spirit of cooperation, we will be able to make rapid progress with the development of technical guidelines and a Carbon Intensity Code; as well as the essential work on the comprehensive assessment of impacts of the measures on developing countries.

> **To achieve our ambitious goals and decarbonise shipping as soon as possible, it is imperative that we remain united in working towards a truly global regulatory framework that implements the Initial GHG Strategy.**

To achieve our ambitious goals and decarbonise shipping as soon as possible, it is imperative that we remain united in working towards a truly global regulatory framework that implements the Initial GHG Strategy.

Regulation is important. But to significantly reduce and ultimately phase out emissions globally, we need new technologies, new fuels and innovation – meaning huge investments, notably in research and development (R&D) and infrastructure.

IMO is stepping up its efforts to act as the global forum and promoter of R&D in zero-carbon marine fuels, bringing together numerous stakeholders, from the public and private sectors, banks and other donors. I strongly encourage all shipping partners to be a part of this.

We must ensure that no country is left behind in the transition to carbon-neutral shipping. IMO is expanding its portfolio of capacity building projects supporting decarbonisation and innovation.

If we all work together, we can ensure that shipping has a truly sustainable, efficient and decarbonised future.

Kitack Lim
IMO Secretary General

Famous art reimagined for a zero-carbon maritime industry.

When artistry meets engineering: Future Seascapes exhibition showcased at the launch of the LR's Maritime Decarbonisation Hub.

The LR Maritime Decarbonisation Hub was officially launched with the opening of an interactive virtual gallery showcasing well-known artworks reimagined to depict a zero-carbon maritime future, shining a light on the need for ships with zero-carbon emissions to be on the high seas by 2030, along with the supporting infrastructure.

LR collaborated with renowned artist, Reuben Dangoor, to reimagine well known 17th and 18th century oil paintings, which were showcased alongside their originals at the event.

The six-piece collection sees works of old masters, including the likes of JMW Turner, Vincent Van Gogh and Claude Monet, and all featuring 'original' zero-carbon sailing ships, recreated to depict carbon-neutral vessels of the future, emerging infrastructure and maritime technologies that will address shipping's decarbonisation challenge.

Included in the collection is JMW Turner's 'The Fighting Temeraire' from 1838. It's one of his most-celebrated works, depicting the last voyage of the warship *HMS Temeraire*, as she is towed by a coal-powered tug down the Thames to be broken up for scrap. This final voyage is replicated in the reworked picture with a futuristic twist, as the decaying *HMS Temeraire* is replaced with a carbon-emitting tanker of today, towed by a tug powered by a hybrid energy source. The piece highlights LR's intention to assist the maritime industry in the transformation of global fleets, forging safe, sustainable pathways to a zero-carbon maritime industry.

Each of the pieces, created digitally by Dangoor, is being showcased as part of a 360 degree virtual gallery tour, hosted at listed venue Carlton House Terrace and available for public view on The Maritime Decarbonisation Hub website.

Whilst the works of art are clearly creative and future focused, they are also grounded in reality. LR's Lead Marine Consultant Yildiz Williams worked closely with Dangoor on each of the artworks to ensure LR's breadth of experience working on cutting edge decarbonisation technologies was woven into the project.

The gallery launch was preceded by a leadership webinar on shipping industry efforts in support of the energy transition. Moderated by Lloyd's List's Richard Meade, the panel discussed the commercial, technical and societal imperatives that are driving the industry towards decarbonisation, the impacts on maritime trade, the potential cost of inaction and what role the Hub will play as the pace of regulation increases.

Speaking at the webinar, President and Group Chief Executive Officer at MISC Berhad, Yee Yang Chien, said: "The energy transition is before us. We are all affected. As shipowners, we must act and this requires a practical approach. The Maritime Decarbonisation Hub is another example of how the shipping industry is really trying, and I am hopeful."

Special Adviser, Ocean, to the UN Global Compact, Sturla Henriksen, commented on the drivers that will help shipping decarbonise: "Most instrumental is how business and markets are disciplining shipping. Financiers are rewarding those who are above regulatory standards, consumers are punishing those who are not transparent, paving the way for higher regulatory standards."

LR's Marine and Offshore Marketing Director, Jeannie Ivanov led the campaign to launch the Decarbonisation Hub, said: "The Future Seascapes exhibition connects the commercial, technical and societal needs to accelerate shipping's decarbonisation journey. The collaboration with Reuben Dangoor enables us to raise the profile of the importance of decarbonising shipping in mainstream society, helping people understand the critical role shipping plays in global trade and society more broadly."

→ To view the 360 virtual tour of the 'Future Seascapes' exhibition and discover more about the Maritime Decarbonisation Hub, head to **www.MaritimeDecarbonisationHub.org.**

Who is Reuben Dangoor?

British artist Reuben Dangoor creates work heavily influenced by current affairs.

When his portraits of Stormzy, Skepta, Dizzee Rascal and D Double E were unveiled in Tate Britain's Legends of the Scene exhibit in 2015 he gained coverage around the globe as the first artist to bring the stars of the Grime movement into a British museum. In 2018, his portrait of Jeremy Corbyn 'dabbing' was shown in The Design Museum Art of Politics exhibition.

In summer 2018, Reuben Dangoor had another huge viral moment when his line drawings of the England football squad were picked up online, in print and on TV. Reuben Dangoor's viral piece of Gareth Southgate was bought by the Southgate family and now sits in the England manager's home office. His 3-D billboard for the BBC's hit Dracula series went viral around the world in January 2020.

The complexities of the fuel supply chain as maritime moves towards zero-carbon.

The challenges of developing more sustainable marine fuels go far beyond ship design and propulsion technology. LR's Marine & Offshore Global Sustainability Manager, Katharine Palmer, explains why the readiness of fuel supply chains is vitally important.

The adoption of new low- or zero-carbon marine fuels confronts shipping with an immense challenge in terms of ship design, propulsion technology, and shipboard fuel management. But experts point out that these issues are potentially easier to resolve than the complexities of the fuel supply chain – from the production of shipping's new fuels to the bunker manifold, or its future equivalent.

The International Energy Agency estimates that 15% of global energy-related GHG emissions are caused by producing oil and gas, and distributing it to consumers. Methane leaks, the Agency said, are the single biggest source. Released in January, the University Maritime Advisory Services (UMAS) and the Energy Transitions Commission (ETC) study found that $USD 1-1.4 trillion is needed to achieve the IMO ambition by 2050. The study also highlighted that around 87% of the total investment is needed in the land-based infrastructure and production facilities for low carbon fuels, suggesting there is a substantial level of investment needed on land.

Katharine Palmer is LR's Marine & Offshore Global Sustainability Manager. "At LR, we use a framework to assess the marine solution readiness level (MSRL) that covers the whole lifecycle of a potential fuel from production to use in a marine application," she explained.

"It is made up of technology readiness, investment readiness, and community readiness. Apart from the asset-related investment, shipping's energy transition will require the production of fuels and development of infrastructure that can deliver zero-carbon energy sources in sufficient volumes, at the right locations and, of course, at the right price. The community readiness part of the formula is based on lifecycle climate benefits, and current and future regulatory compliance."

A step at a time

"Right now, supply chains are not ready for this monumental change so it is too early to start talking about 'supply chain readiness'" said Palmer, by which we mean there is confidence in the supply chain, both in the availability of the quantities required and the land-based infrastructure in place to generate and support a particular fuel. "As we start to narrow down the choices and assess the fuels which have potential to be scalable from 2030 onwards for mass shipping, then we can start to focus on the readiness of the supply chain."

"We need to understand which fuels have the potential to be scalable from 2030," Palmer explained. "Scalability is a function of demand and availability, and we need to understand this in order to start building supply chains. Obviously, we wouldn't invest in supply chains for fuels that do not have the potential to be scalable."

> **Right now, supply chains are not ready for this monumental change so it is too early to start talking about 'supply chain readiness'.**
>
> **Katharine Palmer**
> LR's Marine & Offshore Global Sustainability Manager

Offsetting, whereby fuels containing carbon can still be used provided that they can be more than offset by carbon reductions somewhere else along the supply chain, is part of the IMO GHG strategy. "Although the industry has lots of technological choices available and can make sustainable reductions without having to offset, which would essentially allow the continued use of fossil fuels" explained Palmer.

The transition to zero-carbon fuels maybe considered to be comparable to a transition from fuel oil to LNG as a fuel, but there are some important differences. The scale of investment needed in zero-carbon fuel infrastructure and distribution has not been seen in LNG, as LNG as a fuel only currently accounts for 0.2% of the in-service fleet (0.4% in tonnage), according to Clarksons 2020. Although 6.6% of the orderbook is LNG-fuelled it cannot yet be considered a mass market option.

New fuels from 2030

She pointed out that the pathway between now and 2050 will have different stages. "It is important for zero-carbon energy sources, such as hydrogen, to start to play a role in shipping from 2030," she said. "However, the transition may not be complete for a further two decades.

"The pace of the transition for the production of hydrogen might be different than for shipping, so hydrogen produced from natural gas by steam methane reforming could be used in shipping in the near term, reducing shipping's operational emissions in 'tank-to-wake' terms. However, it will take longer to decarbonise the upstream supply chain to produce hydrogen from renewable electricity, rather than natural gas."

Similarly, most ammonia today is produced using natural gas and steam methane reforming. But ammonia could also be produced using renewable electricity, she pointed out. The chemical, also carbon-free, is already widely shipped by sea as a cargo and, with three hydrogen atoms, is also a very effective hydrogen carrier.

Earlier this year, the classification society announced its involvement in a joint development project (JDP) to develop a tanker fuelled by ammonia – with MAN Energy Solutions, MISC Berhad, and Samsung Heavy Industries. Scope both to transport ammonia as a cargo, and to use it simultaneously as a marine fuel, could be a fantastic supply chain development in terms of carbon intensity reduction.

Fourth fuel transition

Speaking as the JDP was announced, LR's Marine & Offshore Director, Nick Brown, who will become the classification society's CEO from January 2021, noted that LR has already been through three marine fuel transitions in its long history. "These are exciting times as we commence the industry's fourth propulsion revolution … we have supported the transition from wind to coal to oil, and now look forward to safely decarbonising," he said.

The industry's three-decade journey towards 2050 has already begun. But it is already clear that there are many uncertainties along the way. However, Palmer is clear about the strategic direction. "We have three decades to get to net-zero," she said, "and different industrial sectors will not move at the same pace.

"However, in shipping, if we can start by reducing emissions from the sea transport link in the supply chain, we can then focus on decarbonising the marine fuel production process. By then, the substantial investment in renewable energy that is envisaged could well mean that hydrogen, for example, could be entering many countries' gas grids. There would then be opportunities for shipping to use offtakes as a carbon-free fuel," she concluded.

What role could LNG as a fuel play in the future of shipping?

Fossil-free fuels for the future are the talk of the moment, but tomorrow's zero-carbon fuels have yet to be developed, approved, and pumped out on a global scale.

Panagiotis Mitrou is the 'go-to' gas man at Lloyd's Register. A multi-fuel future is likely within this decade but could easily take one more decade to scale up, he says, but in the meantime, we should work with what we've got.

In fact, Mitrou goes further. He says that LNG could conceivably provide a three-decade pathway, forming a robust foundation from which shipping could meet and probably exceed IMO ambitions, and yield other climate-related benefits too.

"We have the fuel today. It's suitable for new and existing ships. And the global distribution network is developing fast," he declares.

Of course, Mitrou fully supports R&D relating to new zero-carbon fuels, including ammonia and hydrogen. But shipowners and operators should understand his thinking: it is extremely commercial. New fuels for shipping are probably many years away as yet, and we have only an indication of when and under what conditions, these will become commercially viable.

So far, therefore, shipowners should only consider committing capital to R&D. And this is already evident in a range of projects relating to hydrogen and ammonia, in particular.

On the other hand, the world has abundant supplies of cheap LNG, an existing global logistics network, rapidly developing bunkering infrastructure, and steady advances in engine and combustion technology for new and existing ships. What's more, today's cryogenic technology paves the way for other really attractive future fuels down the track.

So why are there two very distinct camps – those that believe in LNG's potential as a transition fuel on the road between now and 2050, and those who don't? Mitrou's clear explanation on this point comes before he addresses the chief concerns around LNG as fuel.

> **We have the fuel today. It's suitable for new and existing ships. And the global distribution network is developing fast.**
>
> **Panagiotis Mitrou**
> LR's Gas Technology Segment Manager

Starting out today

"Uncertainty is the mother of inaction," he explains. "Shipowners run capital-intensive businesses … they are entrepreneurs. They will not risk capital if there is no certain outcome. Uncertainty is the enemy! To get to 2030, we need to start the journey today. We can do that immediately, with LNG. We can't do it yet, using any other new marine fuel."

Mitrou compares meeting the IMO's ambitions with governments collecting taxes. "If they don't collect enough to balance the books, they will inevitably want more sometime in the future. Similarly, if shipping fails to meet the IMO's targets by 2030 and beyond, then there will be more regulations, and they will be stricter."

He does not say this, but the inference is that if IMO ambitions are not achieved, the industry's decarbonisation process will be taken out of its own hands – the worst possible case for shipowners because that would introduce unimaginable business uncertainty.

Mitrou continues: "Shipowners want certainty. To meet 2030 aims, they must make decisions today. They don't want to invest in fuels that may prove useful in 2035 but may not. They want to invest in a fuel that ensures a secure outcome."

The carbon issue

Some critics focus on several key negatives, not least the fact that LNG is, of course, a hydrocarbon. And, quite rightly, they point out that claims by LNG advocates often exaggerate the CO2 savings that the fuel can yield. There are many variables, not least engine combustion technology and the LNG supply chain. Sometimes these are conveniently overlooked.

However, although it is a hydrocarbon, LNG could still pave the way to low- and potentially even zero-carbon fuels in the future. Crucially, Mitrou stresses, this progression could be made with the same multifuel engines, while methane deriving capital, technology and expertise could be used in the uptake of zero-carbon fuels.

He stresses that shipping must not forget the lessons of the past. He cites the example of scrubbers and heavy fuel oil

(HFO) versus new low sulphur blends. This was also a matter of business certainty. Owners knew that if they invested in a scrubber for x dollars, and could get HFO for y dollars or less, they could comply with the regulations, pay back the investment, and stay ahead.

"It's a very competitive industry. The same argument can be used for LNG," Mitrou continues. With a relatively high degree of confidence, you can predict that natural gas supplies will be abundant and LNG pricing will remain attractive over the next 10 years. So you could with a reasonable level of confidence get your payback for investing in LNG as fuel. What happens next, no-one yet knows, but by doing something now, you are not at a competitive disadvantage later."

Market forces

But surely you can't compare sulphur and carbon? "Yes … you can," Mitrou responds, "Transformers are available today to oxidise methane and take carbon out of emissions, but there are no incentives for owners to buy the equipment. They are expensive, there are no mandatory requirements yet, and there is no payback. The only way a shipowner would consider such an expense would be for environmental social and governance (ESG) reasons."

Whilst it is possible to use methane (CH4) as a hydrogen carrier, removing the carbon before combustion, it seems far more efficient to burn methane as is, and take out the carbon afterwards. That's because methane has an energy density more than three times greater than hydrogen while the carbon atom offers approximately half of the calorific value, in this manner – "you get more bang for your buck!"

At first sight, the economics look complex but Mitrou quickly dispels this one. "Meeting the target " requires zero-carbon fuels such as hydrogen or ammonia, and this in return will require a price on carbon. When that happens, the unaffordable methane transformers today suddenly become instantly attractive as a means of continuing to use cheap and abundant LNG. And, by the way, we still won't know the cost of the new fuels."

Three decade pathway

However, what is really exciting is that LNG could offer potential in the transition. The adoption of biogas, which can be carbon neutral, or potentially carbon negative, depending on its feedstock. We already have this technology, Mitrou points out, and will be used on new vessels to be deployed by Hurtigruten on its coastal route between Bergen and Kirkenes in Norway.

Initially, these ships will use LNG, with a biogas drop-in derived from fish waste. Later, as more biogas becomes commercially available, the proportions will change – less LNG, more biogas, and a much lower carbon footprint may become real.

Then the next stage, Mitrou suggests, is to assess where biogas could be sourced most effectively from a methane reduction angle. And here, global shipping can benefit from work undertaken recently outside the sector.

The European Union's Methane Strategy, announced in October, reveals that more than half of global methane emissions, 53%, come from agriculture, with a further 26% from waste. If biogas for shipping could be sourced from these sectors, Mitrou explains – by capturing the methane as a feedstock for biogas – then the result could be a fuel with a small, or even negative, carbon footprint.

Although it should be said that there is still uncertainty around how these solutions may develop and the scenarios in which they are viable. At LR, we are undertaking further exploration of biogas as a potential pathway.

Virtuous circle

Methane slip – the unburnt methane that can result from an incomplete LNG combustion process in some ships' engines – is often held up as a major disadvantage of the fuel because methane is a far more aggressive greenhouse gas than CO_2. However, engine designers have made huge strides recently in reducing the scale of methane slip and, in some LNG engines, it is now almost negligible.

However, any unburnt methane is still a greenhouse gas, as it's climate impact is about 30 times more than CO2 on a 100 year time-frame which increases to about 90 times more on a 20 year time-frame.

Here it gets complicated, but Mitrou explains. Methane should be viewed in a 'well-to-wake' context. If methane were captured from the agriculture or waste sectors, preferably both, and used as a feedstock for biogas, this would prevent its atmospheric digestion and the worst of the global warming impact.

Says Mitrou: "In this context, a relatively small volume of biomethane blended with fossil methane could fruit an equivalent footprint quite close to compliance with ambitious targets. For greater volumes of biomethane if the economics work the result could attain net- zero or even negative."

"This would be a virtuous circle," Mitrou concludes. "It would limit the release of highly dangerous methane from other industrial sectors. It could provide global shipping with a close to zero-carbon, or even negative-carbon fuel. And it could use the well tried and tested cryogenic technology – including combustion, storage and bunkering infrastructure – that shipping already has today. This however will depend on recognising the significant GHG emissions abatement potential of biogas/biomethane, as pointed out by the IEA in its report on the 'Outlook for biogas and biomethane: Prospects for organic growth' released earlier this year."

Does biodiesel have a place in the marine fuel purchasing portfolio?

Tim Wilson highlights the potential for biodiesel as a marine fuel and outlines the key points to consider when using it as a blend.

Tim Wilson
LR's Principal Specialist Engineer on Marine Fuels and Exhaust Emissions

As the industry looks to prove the technical feasibility and commercial viability of fuels like ammonia, hydrogen and methanol – and ensure the safe application of electro-fuels – biodiesel is another option becoming more readily available that could provide short-term emission reductions.

Energy efficiency measures are already being applied to varying degrees through innovative ship design, engine power, optimised speeds/navigation and the adoption of hybrid technologies. But a more immediate, non-fossil fuel, lower carbon emitting solution is being sought after by some well-known shipping customers who are looking to reduce the carbon footprint of their retail products. Suppliers also get credit under certain regulatory schemes for putting biodiesel into the market so with the push from the supplier and the pull from the customer, could this provide a short-term solution to reduce shipping's emissions?

LR is conscious of the community readiness issues surrounding biofuels, however this article focuses on the technology readiness as we see more supply into the marine market and an increase in trials in the industry.

The use of biofuel in a diesel engine is nothing new, in fact the first successful diesel engine test was carried out in 1897 by Rudolph Diesel on straight peanut oil. At that time, Diesel predicted that vegetable oils would become a fuel source as important as petroleum products. Petroleum (fossil) fuels originally won out over bio-derived because of cost. The tables are now starting to turn however, as urgent climate action is needed.

Currently, bio-derived fuels are widely used in the non-marine transport and power sectors. The most widely used is FAME (fatty acid methyl ester), derived from waste cooking oil or another feedstock, generally referred to as "biodiesel". This is mainly used as a varying percentage blend component in petroleum diesel. However, biofuels come in a variety of other forms, such as higher viscosity residue-based biofuels to the more advanced products, such as the hydrogenated vegetable oil (HVO), often referred to as "green diesel".

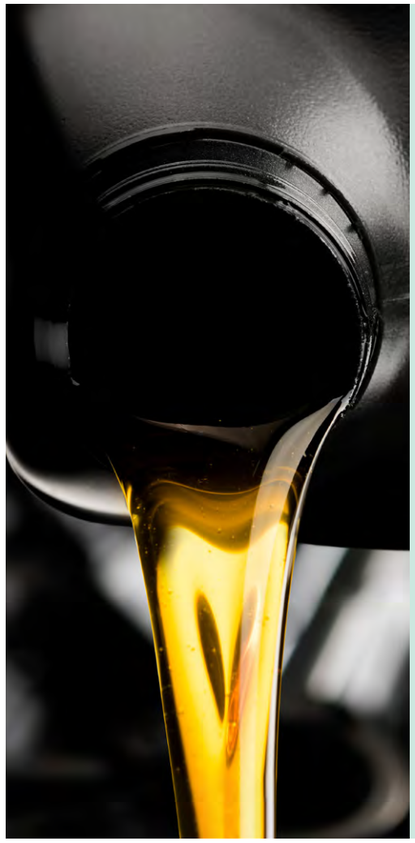
Ship operators are now starting to look towards available and affordable biodiesel. This is being seen as a "drop-in" (no change requirements for fuel storage, handling system, machinery setting or supply infrastructure and distribution) interim solution for reducing carbon emissions. The degree of carbon reduction will depend on the percentage ratio of biodiesel blended into the distillate marine (DM) or residual marine (RM) fuel and the original choice of feedstock used to produce them. The sustainability credentials of biofuels are contentious and from a lifecycle perspective, some could have worse carbon credentials than the fuels they are replacing, depending on the biomass feedstock used. The Roundtable on Sustainable Biomaterials (RSB) and the International Sustainability & Carbon Certification (ISCC) organisations both offer certification against sustainability criteria for bio-derived fuels.

LR is involved in several projects following growing interest by a number of shipowners and suppliers to trial the use of biodiesel blends. This is not just at the B7 in DM fuel (i.e. 7% biodiesel blend ratio), but expanding further to higher blends ratios, ranging from B20 to B50 (20 to 50% biodiesel), in the new RM very low sulphur fuel oils (VLSFOs), and we have even had some enquiries for B100, 100% pure FAME. Some ships are also sailing with 100% other bio-derived fuels and claiming up to 90% carbon reduction benefits. Biodiesel derived from varying waste oil feedstocks are favoured for a blend combination. Despite some increase in cost, their global consumer base is seemingly more willing today to cover this increase for the benefit of the environment. This is clear evidence that biodiesels are back on the marine bunker's options portfolio.

Sustainability credentials aside, biodiesel offers a marked reduction in hydrocarbons, particulate matter and carbon monoxide. However, because of the molecular nature of FAME, nitrogen oxides (NO_x) may rise as much as 15% or more, when combusted in a diesel engine, depending on the original feedstock, the blend ratio used and the engine itself. IMO MARPOL Annex VI Reg. 18.3.2.2 specifically states however, that fuels from non-petroleum refinery methods shall not cause an engine to exceed the applicable emission limit, leaving the marine industry in a conundrum, which was raised in the IMarEST Submission to IMO MEPC 70-7-2.

NO_x emissions can only be determined by measurement from the combustion of the biofuel in service. To this extent any ship running a biofuel trial are best to consider direct measurement of the NO_x emissions and seek their flag state guidance as to the exemption required for Annex VI Reg 18.3.2.2. under Reg 3.2 (Trials for ship emissions reduction…) against

The use of biofuel in a diesel engine is nothing new, in fact the first successful diesel engine test was carried out in 1897 by Rudolph Diesel on straight peanut oil. At that time, Diesel predicted that vegetable oils would become a fuel source as important as petroleum products.



Important points to note when considering using a biodiesel blend:

1. The use of blends up to B50 in VLSFO-RM or DM are still very much on trial. Ships should initially take a precautionary approach, applying similar practices to that applied in the VLSFO Ship Implementation Plan (SIP) for the transition into 2020. It is important to understand the characteristics of FAME, monitor its impact on ship machinery performance and handling characteristics. You should take into account CIMAC and ISO guidance documents, along with seeking Class, original equipment manufacturer and SME guidance, as offered by LR advisory services.
2. NO_x emissions from biodiesel combustion may rise, the degree of which cannot be predicted without direct measurement in service (taking into account measurement methodologies defined in the NTC, which require the results to be in grams per kilowatt-hour (g/kWh) not in parts per million (ppm)); flag state guidance for exemptions to Annex VI reg 18.3.2.2 under Reg 3.2 should be sought for a trial and specialist guidance on the specifics and challenges of in-service exhaust emission measurement should be sought, LR's technical team are well placed to support with this.
3. Determining the sustainability of a biodiesel product is a complex path. Suppliers should ensure their product is certified to recognised sustainability standards and customers should request access to verify such certification, obtainable from independent bodies such as the Roundtable on Sustainable Biomaterials (RSB) or the International Sustainability & Carbon Certification (ISCC);
4. There are carbon accounting issues. Under EU and California fuel standards all biofuels are accounted for as being zero. The International Civil Aviation Organization framework does not have a blanket approach and has CO_2 for different pathways. The IMO Data Collection System (DCS) scheme currently accounts for operational CO_2 emissions and not lifecycle carbon emissions of the fuel being used. The IMO has committed to producing lifecycle guidelines for low-zero carbon fuels but there is uncertainty around how these will be used in future regulations.

which they may unknowingly exceed the NO_x restrictions.

Reduction of CO_2 emissions from waste cooking oil of up to **88% for B100 can be expected,** dropping proportionally according to the % blend ratio with conventional diesel, when accounting for the full lifecycle GHG analysis of the fuel. The actual decarbonisation benefit is dependent on the sustainability of the feedstock used, the energy to produce it and its impact on land use.

Scalability of production is a huge issue and availability of supply is limited, compared to the conventional fuel quantities consumed by the marine sector today. Although it is readily produced in most countries from wide-ranging oil seed crops, with waste cooking oil being derived from their use, it is suited mostly for a percentage blend offering. However, there are also ambitious reduction targets on crops in some countries which could lead to price increases due to the supply constraints. Some governments require between 5% and 20% of biodiesel to be used in fuels for land-based usage, and in a few cases marine also. So, although it may have a role in taking short-term action today, biodiesel's mid- to long-term use has uncertainties over price, availability and sustainability.

Due to the storage and handling challenges in the use of FAME, addressed in the **International Council on Combustion Engines (CIMAC) guidance document,** and considering the harsh ambient conditions for storage and handling onboard a ship, the marine industry has taken a more cautious approach for the use of biodiesel. Back in 2010, during the revision of the **ISO 8217:2010 standard,** a de minimis level for FAME was included in marine fuels purchased against both the RM and DM tabled standards, due to limited in-service performance experience at that time into the use of biodiesel blends in the marine sector. References to the FAME national standards to be met of EN 14214 and the ASTM D6751 were included to provide some initial quality measures on the FAME being supplied.

The ISO 8217:2017 revision amended its initial cautious approach to the presence of FAME based on further performance experience; thus included that some hydrocarbons from synthetic or renewable sources might be blended into the predominant component of petroleum-derived hydrocarbons fuel that the standard represents. The first biodiesel blended grading was introduced as the distillate FAME (DF) grades for up to 7% (B7), which was very much in line with the automotive industry at the time. The otherwise FAME free categorisation was redefined as not to exceed a de minimis level of approximately 0.50%.

→ **If you have any questions or require any further information about biofuels, please email Timothy.Wilson@lr.org**

Will the pandemic open new doors?

If our industry can adapt and innovate like we have done throughout COVID-19, imagine what we can do to accelerate decarbonisation efforts if we apply the right thinking and the right resources, says new BIMCO Secretary General & CEO.

The COVID-19 pandemic has shut down offices, ports, schools, and society. As the second wave hits many parts of the world, it may be tempting for governments and corporates to turn focus inwards, and deal with national or corporate matters, as opposed to fixing those on the horizon and common goals.

In our own industry, we need to remind ourselves daily that our focus must remain firmly on the long-term goal of decarbonisation, while continuously fight for the urgent issues such as the rights of crew to perform crew changes, despite the pandemic and the challenges it brings.

As closed as the world currently seems, I, in my capacity as Secretary General & CEO of BIMCO, continue to see optimism, creativity and positivity from industry players, members and leaders in shipping. What I find encouraging are testimonies from company leaders about the readiness of their organisations to adapt, change and innovate at incredibly short notice when the COVID-19 crisis hit.

Companies and staff worldwide took to working from home, from one day to the next, finding new digital solutions and rethinking how to not only go about, but also improve, functions and businesses. I find this both fascinating and reassuring. If our industry can adapt and innovate to this extent, this fast, imagine what we can do to accelerate decarbonisation efforts if we apply the right thinking and the right resources to the task.

Our industry urgently needs viable and commercially available technology solutions to reduce carbon emissions, and BIMCO advocates for an International Maritime Research Fund (IMRF) to drive innovation in the technology we need to cut carbon emissions by 50% in 2050, and ultimately eliminate those emissions.

For innovative solutions to succeed however, the right policy framework is needed too. BIMCO continues to call for global action on reducing CO_2 emissions, as opposed to national or regional schemes. Therefore, we have voiced concern over the EU proposed implementation of a regional Emissions Trading System (ETS), as we fear the inclusion of shipping in the EU ETS will inhibit global action on reducing CO_2 emissions. We fear that shipping risks getting hit by multiple emission trading systems; once the scalable technology is available, this will make any global MBM (Market Based Measure) much more difficult to achieve.

We therefore urge the EU to work with the international community at the International Maritime Organization (IMO) on this critical activity to ensure that the industry continues to operate on a level playing field.

If the shipping industry operates on a level playing field globally, companies can focus on all the invaluable lessons learned during the COVID-19 crisis in a bid to fuel innovation and speed up decarbonisation efforts.

David Loosley
Secretary General & CEO of BIMCO

> **What I find encouraging are testimonies from company leaders about the readiness of their organisations to adapt, change and innovate at incredibly short notice when the COVID-19 crisis hit.**

Green energy: offshore wind on spectacular growth trajectory.

Global investment in offshore wind is forecast to soar in the coming decade. LR's Tristan Chapman discusses some of the market fundamentals with Horizons.

Tristan Chapman
LR's Senior Vice President, Clean Energy

Although 'clean energy' covers a range of sustainable power sources, LR's Senior Vice President, Clean Energy, Tristan Chapman, currently spends most of his time on offshore wind. He sees the sector poised to begin a new phase of exponential growth which will see sweeping changes to the fundamentals of the market as we know it today.

The UK holds number one slot, measured in installed power capacity from offshore wind. The country's energy, generated offshore by wind, is forecast to rise from 10.5GW today, to 27.5GW by 2026, according to recent analysis undertaken by Oslo-based Rystad Energy. For the UK, wind generated offshore will exceed shore-based output, also overtaking solar power by a large margin.

In a wider context though, the backdrop will change, China will probably push the UK into second place during this next decade, with the US suddenly appearing from nowhere at number three. The Netherlands will slip to fourth, followed by Germany at five.

US potential

LR is well-placed to assist in the projected growth forecast in the US (see article on page 18), spurred partly by the change of Administration, but mostly because the country is almost a newcomer to this sustainable energy source. LR is well-prepared to service the requirements of developers and has been actively assisting in early stage cost benefit analysis and infrastructure design for some time.

Jay Borkland, a senior engineer and offshore wind specialist recruited to join the classification society's US Renewables Team in 2018, is now Chairman of the prominent Business Network for Offshore Wind. Although broad policy on the sector may be generated at a federal level, Chapman explained that many of the practical issues are decided by individual states, which have responsibility for managing energy at local level and where Borkland is well-connected. Energy from offshore wind farms feeds directly into electricity grids operated by the states themselves.

The slow start in the US is down to several factors. There is lots of space ashore, and wind power generated ashore is already a large energy contributor to the country's electricity needs. In fact, in April 2019, Chapman revealed that onshore wind contributed more electricity to the grid network than coal.

But the main reason is that the US has plenty of cheap energy already. A few years ago, it was expecting to import large volumes of LNG; now it's a prominent exporter. And supplies of cheap shale oil and gas should ensure that the country remains a net exporter for years to come.

This explains why only 30MW of power is generated by offshore wind today, at an offshore farm near Rhode Island. However, there are bold plans for large-scale investment off the country's north east coast, where the sea is relatively shallow, and in the deep waters off its Pacific coast. Fixed and floating technologies are likely to be adopted, respectively.

Maturing markets

Chapman explained that underpinning the sector's likely expansion more generally is the fact that the renewables business – and offshore wind in particular – is no longer seen as a slightly whacky technology that will never work without huge subsidies. Having reached maturity, the sector now offers an attractive and credible story to funding institutions. Offshore wind developers can talk confidently with investors whose funding plans commit to certain internal-rate-of-return targets, independent of subsidies.

"We needed the maturity, the regulations and the independence to satisfy the money markets that attractive returns are available," Chapman commented. "Unsubsidised wind can now be delivered competitively and profitably." He added that LR has been closely involved in the US since the early days "when the first innovative structures found their way into the water".

LR has also undertaken risk assessments throughout the development of offshore wind power so far. These processes are likely to become much more important, Chapman believes, for two main reasons. The whole point of green energy is to reduce the potential harm to the planet that results from hydrocarbon extraction and related power generation.

Exactly the same argument applies to offshore wind infrastructure – the potential disruption of birds' migratory habits, for example, and the impact of offshore construction on sea life. That is one of the reasons, Chapman added, why the front-runners in the offshore wind development

The US offshore wind sector prepares for take-off.

The United States has dramatic ambitions for offshore wind development. So far, the country has made little of the enormous potential that lies offshore, but things are about to change, says Rafael Riva, LR's Commercial Manager in the US.

Following a change of Administration and renewed ambitions to harness the potential of renewables in the US energy mix, the country's offshore wind sector is brimming with anticipation. According to estimates by BVG Associates, a UK-based renewable energy consultancy, offshore wind capacity in the US is estimated at just 30MW, compared to more than 22GW in Europe.

"There are a wider range of opportunities on both the Atlantic and Pacific seaboards," said Rafael Riva, who is closely involved in LR's offshore wind activities in the US. "With lots of focus on cheap energy from shale deposits, energy companies had left wind power until later. But now we get the sense that widescale development has already started."

US offshore wind power today is generated at just one facility – the Block Island Wind Farm – developed by Deepwater Wind, now Ørsted US Offshore Wind. The five-turbine site is three miles off the coast of Block Island, just south of Rhode Island.

Huge opportunities …

However, although the strength of the wind hasn't caught much US attention so far, Riva highlighted BVG estimates that today's 30MW could soar to 33GW by 2030, an astonishing capacity increase by a factor of more than a thousand. Even two-thirds of that increase, if the figure turns out on the high side, would create huge opportunities for wind infrastructure participants, including turbine and fabrication technologists, and installation specialists, he said.

Meanwhile, in the longer term, the numbers are even more dramatic. With the proviso that stable policies remain in place, the US Department of Energy has forecast that offshore wind could generate as much as 86GW by the middle of the century – almost 2,900 times more than today.

To be fair, some clearly had realised the sector's potential. When the US Bureau of Ocean Energy Management ran the last auction for Massachusetts offshore wind blocks in 2018, the event exceeded all expectations, raising more than $405m from just three offshore blocks.

Exceeding expectations

Each block sold for about $135m, over three times more than the average $42m for similar blocks raised two years earlier. Norway's Equinor bought one, Mayflower Wind, a joint venture between Shell, EDP Renewables and Engie acquired a second, and a bid by Vineyard Wind LLC, a joint venture between Copenhagen Infrastructure partners and Spanish renewable energy company, Iberdrola, won the third.

Riva explains that most of the country's offshore wind potential so far lies in two regions – off the north east coast, Massachusetts in particular, mostly in shallow water, and off the west coast, where the continental shelf plunges rapidly into the deep waters of the Pacific. Therefore, he says, east coast wind development will focus mostly on fixed installations, while those on the west coast are more likely to require floating installations.

He points out that LR is well-placed to provide a range of services, including Certified Verification Agency (CVA), Investment Efficiency (IE) appraisal, and ITC Verification. "The Shells, BPs, and Equinors of this world know us well from our work with them in Europe. We've worked with a number of the wind power pioneers for many years and have a wealth of experience in the sector. And the verification functions in wind are similar to those in oil and gas."

In addition to Riva's hard work, Jay Borkland, an offshore wind specialist part of LR's US Renewables Team, is leading the charge on developing advisory services in the US, focusing on ports, infrastructure and supply chain opportunities. Due to the scale and pace of development, LR has partnered with leading advisory firms such as, BVGA, Jacobs and Timmons Engineering. Much like developers who are forming Joint Ventures to manage risk and finance projects, such as EDPR & Engie forming Ocean Winds, Equinor & BP partnering in New York, and Macquarie & Iberdrola, for a professional services firm like LR, partnering is an innovative business model that is expected to grow significantly over the next five years.

Jones Act constraints

One new challenge to offshore wind is Jones Act compliance, or to give its formal title – The Merchant Marine Act of 1920 – will apply to certain aspects of offshore wind development. US-built ships, flagged in the US, and manned by US nationals will be required for the installation of wind power plant, and also for the supply and service of facilities.

It will apply to vessels that transport components "between points in the United States". Under the 1953 Outer Continental Shelf Lands Act, any man-made structure fixed either temporarily or permanently to the seabed, is defined as a "point" on the outer continental shelf, which generally extends 200 miles from the coast.

Riva noted that, so far, there are no US-built wind turbine installation vessels and, if the sector takes off as expected, there will be a pressing requirement for such vessels. This could present opportunities for European companies seeking a foothold in the US offshore wind sector through the establishment of joint ventures, LR has already solidified a Joint Industry Project with a US Engineering firm for the development of a Jones Act compliant wind turbine installation vessel (WTIV) design, he said.

sector all insist on the very latest climate-friendly features on their heavy-lift transport ships, wind turbine installation vessels, and service craft.

He also made the point that, until recently, it was a challenge to assess the likely impact of offshore developments, and to measure accurately their performance in operation. Digitalisation and smart technology now allow these measurements, both in real time and for predictive analysis.

These factors, together with revised energy policies at a federal level, are likely to kick-start new investment. "I think we're going to see a lot of projects getting the green light in 2021," Chapman predicted. "We're excited by the growth potential."

Offshore benefits

Although offshore wind power is still more expensive than other energy sources, the delta is narrowing. This process will continue, Chapman explained, for two main reasons: despite the environmental challenges, there are no local planning constraints and no 'nimbyism' in offshore locations. What's more, wind speeds are much greater and, as the size of offshore plants increases, economies of scale will have a substantial impact.

However, Chapman noted that there is no 'one size fits all'. Offshore plant has to be designed specifically with local conditions in mind. In the US, ports and offshore infrastructure in the Gulf of Mexico are well-developed. Off the coast of Massachusetts, for example, this is not yet the case.

The particular conditions prevailing in a location will also determine the choice of technology – fixed or floating. Here, Chapman pointed out, LR has a substantial book of experience in both, having been closely involved in the first floating production storage and offloading units in the late 1970s, as well as the first tension leg platforms a few years later.

Offshore wind generated from floaters is still about four times more expensive per megawatt hour than from fixed structures. But, he pointed out, the scalability that is now evident at fixed installations is not yet available in floating plant. This is only a matter of time, however. Furthermore, floating infrastructure lends itself to more conventional construction processes and could offer a completely new revenue stream for shipbuilders reeling from a serious downturn in new contracts.

Global sentiment

The delay of COP26, originally scheduled to be held in Glasgow in November but now postponed for a year, probably has a silver lining, Chapman believes. The one-year delay, greeted with disappointment at the time, could prove to have various benefits.

At a practical level, the impact of autonomous systems is transforming the design and operation of wind farms. Autonomous survey vehicles using digital technology can map the underwater terrain far more accurately while the unmanned operation of wind farms is also well-advanced.

In 2019, some facilities recorded just three visits per turbine over the whole year. Datacentric systems now feed lots of data back to central control rooms. These developments have a substantial impact on breakeven energy prices.

Meanwhile, at a macro level, the delay will provide the opportunity for more countries to understand the support the potential that sustainable offshore wind offers. And the fact that the US is likely to be sitting at the table in Glasgow will be hugely beneficial, Chapman declared.

How can nuclear support shipping's route to zero-carbon?

Vince Jenkins reviews existing benefits of the uranium-based fuel, public perception and its challenges.

Vince Jenkins
LR's Global Head of Technology, Risk Management

Nuclear power has been used at sea since the US Navy launched the *Nautilus* in 1955. Since then there have been many thousands of safe reactor operating years achieved in the maritime environment. Today, there are approximately 100 reactors in maritime use. Russia has operated nuclear-powered icebreakers since 1957 and has a floating nuclear power plant operating, China is also expected to build 20 floating nuclear power plants. It's quite clear that nuclear power in the maritime environment is a proven technology, it is also completely zero-emission. So, is power from the atom an option to help the industry meet the IMO GHG 2050 requirements? Public perception is an important factor to consider when looking at nuclear power, some say 'it's too expensive' or 'it's not safe' and 'we do not understand it'. LR's Global Head of Technology, Risk Management, Vince Jenkins takes a closer look at these challenges and determines whether they are true or false.

CAPEX vs OPEX

The power source is often labelled 'expensive' – this is true as nuclear front-loads the CAPEX costs. The OPEX costs, however, are relatively low since the fuel is a small part of the cost. A nuclear build typically looks at total life costs, which is different to how ships are currently built and operated, which is CAPEX costs and then OPEX. Decommissioning and storage of used fuel is a cost which is included in nuclear builds, this is a contrast to how the waste from fossil fuel is treated, which is emitted into the atmosphere and has contributed to shipping's CO_2 emissions.

With all future fuels, the industry needs to consider the total externalities of their use which will have to be controlled and costed. A matter which is currently being debated by the IMO – specifically the market-based measures, a pricing mechanism for emissions.

Volume production, by which we mean the total amount a company can produce over time, is not something that the nuclear industry has focused on in the past, it tends to be one-off plants. Now, there are companies designing small modular reactors (SMRs). Unlike the GW power station plants, SMRs are in the 10's – 100's MW size, which focus on volume production and significantly reduced costs. There are also new reactor designs, such as molten salt reactors (MSRs), being developed which target the maritime sector, with some claiming that costs are competitive with the expected zero-emission fuels, a compelling argument. Nuclear locks in future fuel costs so fuel price variability is removed, this is because reactors require at most refuelling every 3-5 years. MRSs, currently being developed by TerraPower and CorePower, can fuel a ship for up to 25-30 years, the lifetime of most ships. This means the global production and supply chain is massively reduced when compared to more conventional liquid fuels. For ammonia and hydrogen, the logistics chain has yet to be established.

Safety implications

Surprising to some, the nuclear industry has an enviable safety record. Our World in Data, part of Oxford University, produced a graphic in February about the 'Safest and cleanest source of energy', which examined coal, oil, natural gas, biomass, hydropower, nuclear, wind and solar. Just behind wind, hydropower and solar, nuclear was the safest in terms of lowest death rates and emitted the lowest amount of GHG emissions compared to all other fuel types. Although, let's be clear, the inherent hazards of any of the new powering technologies, whether that's ammonia, hydrogen or nuclear, will have to meet the maritime safety standards established.

There are existing regulations in place for nuclear power such as SOLAS Chapter VIII, written in the 1970s, which refers to nuclear propulsion. This was developed around the safety of pressurised water reactors (PWRs) and focused on safety standards at that time. With more than just PWR technology available today and safety and security challenges evolving with each piece of technology, the statutory regulation would require an extensive review and upgrade. Furthermore, it's likely that UNCLOS, the piece of UN legislation which allows ships to move from one country to another unimpeded, irrespective of propulsion type or cargo, will need to be adapted to allow free global movement of nuclear powered vessels. Point to point operation, however, would just require the agreement of the countries involved. LR produced a high level framework of rules for nuclear propulsion in 2010, with the key focus of safely integrating a licence reactor into a ship, and can be considered a 'strawman' for the industry when considering nuclear power.

Lack of understanding

It's true that the physics of liberating energy from the atom are different from burning a liquid fuel in an internal combustion engine or using batteries, for instance. Nuclear technology also introduces significant changes in terms of how the industry would operate. For example, there is little or no bunkering required, depending on the reactor, which raises questions around how the fuel paid is for, particularly as charterers normally pay for it. There are many other changes which would need to be addressed.

Monumental structural changes like these are always challenging. The maritime industry has been here before however, when we moved from sail to steam and then to the internal combustion engine, or the move from break bulk cargo to containers. The next structural change of zero emission ships will be just as challenging.

Of course, there's no 'silver bullet' or single solution to shipping's zero carbon transition and it's likely that a group of fuels will be selected, particularly as each owner and ship type varies in terms of operational needs. Each fuel option brings its own inherent hazards which must be managed, which will incur substantial investment. The significant cost of establishing a global supply chain and port infrastructure for the bunkering of liquid fuels should not be underestimated.

Wikimedia Commons / Victor-ny

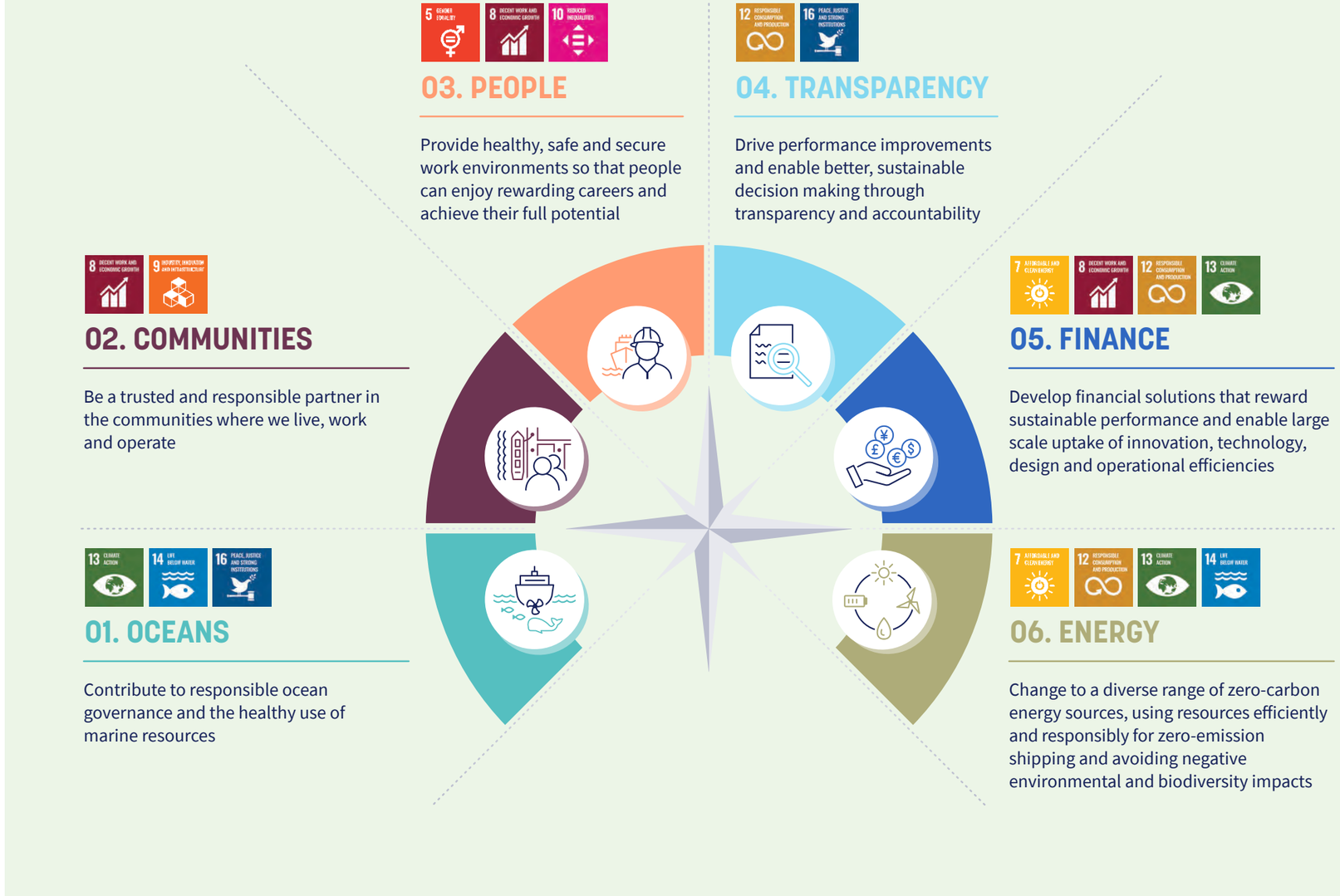
It's quite clear that nuclear power in the maritime environment is a proven technology, it is also completely zero-emission.

← The USS Nautilus permanently docked at the US Submarine Force Museum and Library, Groton, CT

The sustainable road ahead.

Shipping faces major global challenges: from a changing social and volatile economic context; to increased demand for transparency from customers through to investors; to the climate crisis and the need for rapid decarbonisation. These challenges coupled with industry trends will reshape the industry, while bringing opportunities across and beyond the shipping value chain.

Words by Andreea Miu, Elizabeth Petit, Nicole Rencoret, and Andrew Stephens (Sustainable Shipping Initiative)



The future is never certain – 2020 has been a case in point – but a strong plan can help underpin one's ambitions. This is particularly true for the global drive on sustainability and all sectors – marine and offshore included – stand to benefit from clear objectives on how to get there.

Developed by members of the Sustainable Shipping Initiative (SSI), the Roadmap to a sustainable shipping industry lays out the pathways and defines tangible milestones to be collectively achieved for a sustainable and successful shipping industry.

The Roadmap consists of six vision areas – Oceans, Communities, People, Transparency, Finance, and Energy – each with its own set of objectives and interrelated milestones to be attained along the industry's sustainability journey over the coming decades.

It is a resource for stakeholders across the shipping value chain, to be used by companies and organisations to identify and understand their present and future sustainability challenges, as well as the steps and milestones to overcome them. The Roadmap deepens individual and collective understanding of sustainability barriers and opportunities and empowers stakeholders to find innovative solutions.

A roadmap for the shipping industry, by the industry

The Roadmap was initially developed in 2016 as a way to provide an overview of the defining factors, milestones, and priorities needed to achieve a sustainable shipping industry. SSI members identified global challenges and trends expected to affect the industry, publishing the Roadmap as a call to action and kickstarting the debate on how the industry would respond.

In light of rapid and complex changes since its launch, SSI commissioned Lloyd's Register (in collaboration with SSI members) to review progress against the Roadmap in the first half of 2020. Consisting of a desktop review, expert interviews and stakeholder consultations, the review considered changes in the industry landscape, highlighting progress and identifying gaps. The update process resulted in the consolidation and review of milestones – shared over the next few pages – to ensure their ongoing relevance and robustness as indicators of industry progress.

A living document

While we are confident that the outcomes of the recent review will resonate with many, we know that for the Roadmap to remain relevant and track how shipping moves further along in its sustainability journey, it must be a working tool for every stakeholder across the value chain.

As a living document, the Roadmap will continue to evolve with the industry, celebrating successes, pausing for reflection and identifying areas where further work needs to be done. Through a periodic review and update process led by the SSI in consultation with industry stakeholders, we will ensure that progress against the vision areas and milestones is tracked while also capturing changes in the landscape.

But we need your help to do this. Enable us to track industry progress by sharing what you are doing for a sustainable shipping industry at **www.sustainableshipping.org/roadmap/**

The Sustainable Shipping Initiative

The Sustainable Shipping Initiative (SSI) is a multi-stakeholder collective of ambitious and like-minded maritime leaders, driving change through cross-sectoral collaboration to contribute to – and thrive in – a more sustainable shipping industry.

SSI members span the entire shipping value chain, from shipowners and charterers; shipyards, marine product, equipment and service providers; banks, ship finance and insurance providers; classification societies; and sustainability non-profits.

www.sustainableshipping.org

Six vision areas for a sustainable shipping industry.

Each of the Roadmap's vision areas is aligned with the Sustainable Development Goals, emphasising the important role of shipping's sustainability journey to the achievement of the UN's 2030 Agenda.

Spread across the vision areas is an array of 60 milestones that serve as a set of indicators against which the industry can report and track progress, offering insights and guidance on the sustainability issues and navigating through our collective journey to a sustainable and successful maritime industry.

VISION AREA 1: OCEANS

Goal: Contribute to responsible ocean governance and the healthy use of marine resources

The shipping industry has a role to play in building a resilient and sustainable blue economy, taking responsibility for the ecosystems and communities affected by their operations. Vision area 1 is about strengthening shipping-related ocean governance; access to and healthy use of marine resources; and robust marine spatial planning systems.

Objectives

- Establish a system of global ocean governance for a resilient and sustainable blue economy balancing access to, use and conservation of marine resources
- Support development of a system of well-enforced marine spatial planning and marine protected areas

There are signs of momentum building in global ocean governance, reflected by increased awareness of ocean issues e.g. the UN Decade of Ocean Science for Sustainable Development, the development of an Implementing Agreement to UNCLOS, and increased recognition of the need for regulation on ocean noise. An increasing number of national marine spatial plans are being developed, which are expected to bring more clarity and reduce conflicts on competing maritime resource demands; however, their enforcement remains a challenge.

Changes in the ocean governance landscape are reflected in new Roadmap milestones, including those on sustainable blue economy principles and expanding the vision area's scope to encompass the access, use and conservation of marine resources and space.

VISION AREA 2: COMMUNITIES

Goal: Be a trusted and responsible partner in the communities where we live, work and operate

Port, coastal and indigenous communities are key in achieving a sustainable and successful shipping industry, providing shipping with the license to operate. Vision area 2 focuses on port governance, infrastructure and operations; as well as transparency, accountability and communication between shipping and the community stakeholders affected by its activities.

Objectives

- Promote good port governance principles with well-defined standards, transparency and accountability
- Engage and benefit the port, coastal and indigenous communities affected by shipping, facilitating dialogue among all community actors
- Build sustainable and resilient port infrastructure and operations to enable energy efficiency, improve air and water quality and promote circularity

An emerging trend in this area relates to port infrastructure and operations, building circular economy principles into their operations and linking different phases of the ship lifecycle. By serving as a natural convergence point, ports can facilitate the linkages between phases of the ship lifecycle, bringing together shipowners and operators, service providers, ship repair and recycling yards and others, improving efficiency and sustainability throughout the value chain.

Engagement and collaboration with those communities along shipping routes are key to addressing outstanding industry challenges such as shipping traffic, corruption and piracy.

The Roadmap's definition of communities has been expanded to include all those affected by shipping: port, coastal and indigenous communities, and emphasised the need to map out and understand the impacts shipping may have on communities, natural habitats and wildlife in the areas where it operates.

VISION AREA 3: PEOPLE

Goal: Provide safe, healthy and secure work environments so that people can enjoy rewarding careers and achieve their full potential

The systemic challenges faced by seafarers and other workers across the shipping value chain create labour and human rights risks, as well as mental health and safety concerns. Training and career development support combined with equal, diverse and inclusive work environments lay the foundation for fulfilling shipping careers, which is the focus of Vision area 3.

Objectives

- Adopt labour and human rights standards across the shipping industry to improve safety, security, living conditions, and fair wages for people working in shipping
- Employ best practice in leadership and employee development to attract people to rewarding shipping careers
- Embrace diversity (including age, disability, ethnicity, gender identity, race and sexual orientation) and facilitate equal, diverse and inclusive work environments

The COVID-19 pandemic and ongoing crew-change crisis in 2020 has thrust seafarers into the spotlight, highlighting not only their essential role in the global economy, but the labour and human rights risks they face. Numerous agencies and organisations are working to improve the immediate situation by calling on governments to designate seafarers as key workers and facilitate safe passage to and from their homes and vessels.

Recent events have revealed a lack of transparency on how these risks are addressed across the supply chain, with implications for shipowners and operators, charterers – among others – to step up in delivering on seafarers' rights, reflected in a recently launched project led by SSI and the Institute for Human Rights and Business.

A number of these human rights risks emerge repeatedly across different phases throughout the ship lifecycle, drawing on standards including those set out in the UN Guiding Principles on Business and Human Rights.

In parallel, the International Labour Organization is currently accepting proposed updates and amendments to Code of the Maritime Labour Convention (MLC), to be discussed in early 2021 at the fourth meeting of the Special Tripartite Committee (STC) of the MLC.

Andrew Stephens
Executive Director, Sustainable Shipping Initiative

The Roadmap shows us what sustainable shipping looks like, highlighting how we as an industry can play our part in the achievement of the SDGs. From ocean governance; to port and coastal communities; seafarers; transparency; financial solutions to enable innovation; to shipping's decarbonisation – all of these elements are key in our journey to a sustainable, successful industry. We hope all stakeholders engaged across the shipping value chain will find the Roadmap useful and reflect on the pathways that we can individually and collectively contribute to, navigating to sustainable shipping in the months, years, and decades to come.

Roger Charles
Executive Director, Environmental and Social Risk Management, Standard Chartered Plc

Shipping's sustainability journey presents an opportunity for financial institutions to get involved and drive changes in the global fleet by supporting R&D and the development of operational and technological improvements. Beyond the investment needed for the rapid decarbonisation of the industry, banks, investors, insurance providers and others must also consider what sustainable investment means in a broader maritime context – using concepts like the blue economy and tools like this roadmap to guide thinking in this area.

Jacob Sterling
Head of Technical Innovation, A.P. Moller Maersk

At Maersk we believe in taking responsibility through collective action when it comes to pursuing solutions to contribute to the SDGs. We're committed to maximising the positive, and mitigating the negative impacts across our operations – ranging from the full decarbonisation of our shipping operations to improving ship recycling.

The Roadmap to a sustainable shipping industry provides a unique and ambitious overview of the milestones and priorities for us and our peers across the maritime sector, driving shipping's sustainability journey in the decades to come.

VISION AREA 4: TRANSPARENCY

Goal: Drive performance improvements and enable better, sustainable decision making through transparency and accountability

Improved transparency and accountability levels the playing field for all. Cargo owners and customers, shipping finance and insurance companies can all play their part by demanding disclosure, using this knowledge to make informed decisions based on sustainability performance.

Objectives

- Monitor sustainability performance and ensure continuous improvement through disclosure frameworks and rating schemes that go beyond compliance
- Maximise shipping customers' leverage and hold the industry to account by demanding transparency and factoring sustainability performance into decision making processes

The world is rapidly becoming more transparent, and demand for transparency is increasing – by customers to their retailers, and by retailers to their suppliers in turn. The Ship Recycling Transparency Initiative is an example of how customers and financial stakeholders are weighing in and demanding transparency on vessel recycling. Additionally, Scope 3 emissions reduction goals are becoming increasingly common, pushing carriers to provide data that backs their sustainability performance claims.

For shipping, this means transparency across operations and the ship lifecycle, improving efficiencies and utilising emerging technologies such as blockchain, which is rapidly becoming a key tool for supply chain traceability and fighting corruption.

VISION AREA 5: FINANCE

Goal: Develop financial solutions that reward sustainable performance and enable large scale uptake of innovation, technology, design and operational efficiencies

Sustainable shipping presents opportunities for the finance sector and sustainable finance solutions impact every milestone in the Roadmap. By rewarding high sustainability performance, financial stakeholders enable the large-scale uptake of innovation, technology, design and operational efficiencies. Finance also has a key role to play in the promotion of sustainable use of marine resources through ecosystem valuation and natural capital accounting.

Objectives

- Reward high sustainability performance through preferential access to capital and insurance
- Assign monetary value to environmental resources to promote their responsible use and reduce negative impacts

Momentum has been increasing across the finance sector, paying increased attention to rewarding sustainable performance and providing access to financing options to businesses that perform well on Environmental, Social and Governance (ESG) factors. Global interest in sustainable finance has skyrocketed, with initiatives such as the Climate Bonds Initiative Shipping Criteria, sustainability-linked loans and green bonds and EU Taxonomy emerging in recent years.

We have also seen maritime-specific initiatives led by banks such as the Poseidon Principles, blue bonds, and the Responsible Ship Recycling Standard, considering CO_2 and other sustainability metrics and how the finance sector can support shipping in its journey to sustainability.

VISION AREA 6: ENERGY

Goal: Change to a diverse range of zero-carbon energy sources, using resources more efficiently and responsibly for zero-emission shipping and avoiding negative and biodiversity impacts

SSI supports zero-emission shipping by 2050. For this to happen, a number of key milestones must be achieved through transitioning to renewable and other zero (or low) carbon fuels and technologies as well as improvements in energy efficiency across the entire ship lifecycle.

Objectives

- Align GHG emissions reductions in shipping with global climate ambitions
- Pioneer improvements in energy efficiency across the entire ship lifecycle, adopting operational practices and innovative technologies to achieve supply chain efficiency
- Facilitate a step change in shipping's energy portfolio, transitioning to renewable and other zero (or low) carbon fuels and technologies

This area has seen increasing global attention and significant progress over recent years, including the IMO's initial strategy (2018) on the reduction of GHG emissions from ships and industry-led initiatives such as the Getting to Zero Coalition (2019). Introduced on 1 January 2020, IMO 2020 saw global regulation reduce the upper limit on the sulphur content of ships' fuel oil to 0.50% (from 3.50%), resulting in a 77% drop in overall SO_x emissions from ships as well as reduction of particulate matter.

As the engagement and ongoing debate among maritime, energy and other stakeholders continues, there remains no consensus on which fuel(s) will emerge as one (or more) winning options for zero emission – and sustainable – shipping. In 2020-21 SSI is working with stakeholders across the shipping value chain to define sustainability criteria for zero (or low) carbon marine fuels.

Robert Haggquist
Charterer, South32

At South32, working with communities is a core part of who we are and what we do. We believe that by working in partnership with our communities we can understand our environmental impact and only by working together can we achieve long-term social, environmental and economic outcomes. It's this strong foundation between industry stakeholders and communities that is vital, indeed essential, to achieve the milestones set out in the Roadmap.

We are proud to contribute to this Roadmap, which sets out the milestones that the maritime sector must achieve across six vision areas in the decades to come, helping us extend our emphasis on local and indigenous communities beyond land-based supply chains and into our shipping operations.

Simon Bennett
General Manager – Sustainable Development, The China Navigation Company

The China Navigation Company is committed to making the shipping value chain sustainable. As founding members of the Sustainable Shipping Initiative, we've worked alongside industry leaders for the past ten years, united by a common goal of collective action and transparency to not only contribute to, but also assist a sustainable and successful maritime sector to thrive.

Stakeholders across and beyond the physical and economic lifecycle of ships must work to coalesce and align on sustainable solutions to help us achieve the milestones featured in this latest iteration of our Roadmap (and as early as possible). We must all act now, and act together, to tackle the diverse challenges facing the sector in the coming decades and contribute to progressing the global sustainability agenda.

Oriana Brine
Senior Strategist, Forum for the Future

The unprecedented system shock to the shipping industry this year underlines the urgent need for fundamental change to create a more resilient, future-fit sector that contributes to a regenerative and just society. We welcome this Roadmap as a holistic tool to drive this transformation, laying out the actions required for stakeholders in the shipping value chain to help achieve the UN's SDGs, and offering clear milestones against which to track the industry's progress towards these goals.

Sebastien Landerretche,
Head of Freight Platform,
Louis Dreyfus Company

As a member of SSI, Louis Dreyfus Company is very pleased to see the launch of the updated Roadmap to a sustainable shipping industry. We believe this will be a key resource and guide, for us and for other industry participants and stakeholders, as we work together toward our common goal to reduce shipping-related emissions and protect human rights.

Katharine Palmer,
Global Sustainability Manager,
Lloyd's Register

We're proud to support SSI with updating its sustainability roadmap in line with recent developments in maritime, ensuring its relevance as we move towards to a zero-carbon future. The Roadmap is an important tool for both the shipping industry and individual organisations, setting out milestones that cover all aspects of social, environmental and economic sustainability, helping businesses develop their own journeys: focusing on where they can contribute positively. The roadmap also translates the UN's SDGs into what sustainability means for shipping.

Mark Lutes
Senior Advisor, Global Climate Policy,
WWF Global Climate and Energy Practice

The decarbonisation of the shipping industry is essential to ensure the world achieves the Paris Agreement goal to limit global warming to 1.5˚C. While the level of climate ambition needed from the sector has not yet materialised, there are voices in the sector, like the Sustainable Shipping Initiative, actively calling for comprehensive climate action on several fronts. It gives hope that the shipping sector will, sooner rather than later, move decisively to decarbonize by 2050 as climate scientists have told us we must.

Crew feel ‘forgotten and abandoned’ LR survey finds.

Findings from an LR survey on maritime workers’ wellbeing during COVID-19 reveal important lessons for our industry.

Words by Tanya Blake

There are currently 400,000 seafarers stuck at sea, according to the IMO, due to government’s travel restrictions to prevent the spread of COVID-19. Another 400,000 are unable to join ships and earn money. Despite lobbying by the IMO and other major shipping organisations, many governments have yet to declare seafarers as key workers to facilitate crew change. Other countries, such as Australia, have declared crew as key workers but seafarers face complicated regional travel restrictions that still make crew change difficult.

Some have now been on board vessels for 17 months with no break or time ashore, far over the 11-month contract limit set out in the Maritime Labour Convention (MLC). Onshore staff also face local restrictions and changes to their working lives during the pandemic. All of these stresses and strains will surely have an impact on crew and shore staff’s physical and mental wellbeing. The maritime industry should expect these issues to go on long after the COVID-19 pandemic. To help provide the maritime industry with lessons on how it can improve its response to the pandemic now and in the future, LR launched an industry-wide survey on 25 June 2020 to evaluate the impact of COVID-19 on maritime workforce wellbeing and operational practice.

Sixty-six per cent of the respondents to the survey were shore staff, while 34% were sea staff. Slightly more than half of the shore staff (56%) said they were back in the office and 42% were working from home, and on average they had 80 days of COVID-19 extended leave. Meanwhile, 40% of ship staff were at sea on a planned contract whereas 33% were at sea on a COVID-19 extended contract, unable to leave the ship or get home. This lasted for 75 days on average. Other ship staff (11%) said they were off contract on planned leave; another 11% were off contract, repatriated from a COVID-19 extended contract; and 4% said they were off contract due to extended COVID-19 leave, unable to join a ship, and reported this lasted on average 150 days.

Responses came from all maritime sectors, with most from dry bulk carriers (17%), tankers (16%), and container ships (8%). Most responses came from the United Kingom (17%), India (13%), Greece (9%), and Australia (9%). What was clear from the survey is that when it comes to wellbeing, ship staff are the ones hardest hit by COVID-19. LR asked respondents to rate how strongly they agreed with a range of statements on their health and wellbeing. Ship staff more often responded ‘strongly disagree’, ‘disagree’, or ‘somewhat disagree’ to the statements. For example, 11% of ship staff said they strongly disagreed with the statement “I am able to focus on tasks at hand” compared with 6% of shore staff. Meanwhile, 20% of ship staff strongly disagreed with “I woke up today feeling rested” as opposed to 11% for shore staff, and 16% strongly disagreed with the statement “I feel happy and in good spirits” while 8% of shore staff strongly disagreed with this.

Ship staff were more negative about their situation across the board, with workload and fatigue, quality and variety of food, and lack of exercise all areas of concern. Maintaining good mental and physical health requires a holistic approach with a good diet, exercise, rest, and support mechanisms needed to feel positive, healthy, and happy. Unsurprisingly,

Ship staff were more negative about their situation across the board, with workload and fatigue, quality and variety of food, and lack of exercise all areas of concern.

Find out more by listening to our podcast on the survey findings

given ship staff's negative responses in these areas, they did not have a positive outlook on their situation or the work they are carrying out. Only 13% of ship staff strongly agreed that they are performing an essential role during the pandemic, and just 8% strongly agreed they feel valued in their role. It is not hard to see a possible link between ship staff's current crew change plight and their views on how essential they are. One crew member respondent wrote they felt "abandoned by my own government". Another wrote, "We work for each and every one of you to have food, water, fuel, cars, etc. We need support in this tough time, but we were forgotten and abandoned by everybody".

Jo Stokes, senior principal human factors consultant at LR, noted that the IMO, the International Labour Organisation (ILO), and the International Civil Aviation Organisation issued a joint statement on the designation of seafarers and air personnel as key workers on 22 May 2020. As of mid-August, 42 countries recognised seafarers as key workers. "For the rest of the countries to do so, there is a need for further political and public pressure to be placed on the remaining countries," she said.

Ben Bailey, director of advocacy, The Mission to Seafarers (MtS), also noted the "patchy" response from the international community on crew change. "We praise the herculean efforts of many ship managers who have had to navigate bureaucratic minefields to effect crew changes," he said. "But the fact that so many countries have yet to designate seafarers as key workers suggests that they have lost the sense of urgency to support those who keep them in the lifestyles to which they are accustomed".

There have been some positive developments too, with Bailey relaying stories of senior company directors phoning crew directly to keep them informed and to offer support. "These efforts need to be communicated to seafarers directly so that they know they're not alone and that all parts of the industry are fighting for them," he added. Tim Springett, policy director, UK Chamber of Shipping, gave a strong message to governments that continue to restrict the movement of crew, "They will face civil repercussions domestically when supply chains are disrupted, and it is visible to the consumer. The most prominent example being diminished medical supplies and gaps on supermarket shelves." He said it would be ideal if companies that rely on international trade by sea could visibly support the efforts to publicise the crew change crisis and push for key worker status to show how vital seafarers are to governments.

Company care

The LR survey also asked respondents about how their organisation has supported them throughout the pandemic. Perhaps surprisingly more ship staff (50%) said they had access to a professional person through their job that can provide personal advice and support, such as a counsellor or welfare officer, compared with 32% of shore staff. Despite the higher ship staff percentage, the ratio of uptake was not dissimilar: 30% of shore staff used professional services and 17% of shore staff took advantage of the help.

Significant crew safety and well-being lessons to be learned from survey.

Spotlight on crew change reforms needed to address humanitarian crisis of stranded seafarers.

An industry-wide survey on maritime workers' well-being during COVID-19, led by LR in collaboration with the UK Chamber of Shipping, the Mission to Seafarers and Safety at Sea, has uncovered key insights which may be used to improve the safety and well-being of maritime industry workers keeping global trade moving during the pandemic.

The online survey launched on 25 June, the "Day of the Seafarer", was conducted to understand the efficacy of COVID-19 measures put in place, to assess how the maritime workforce has been supported during this challenging period and to gather insights about the level of care and welfare provided in order to share findings with the entire industry.

Key survey findings

Recognition and value

Overall survey results indicate that many providing essential services in the ocean economy are feeling undervalued. When asked whether they agreed with the statement 'I feel valued in my role', only 8% of seafarers strongly agreed, and just 13% felt they were performing an essential role during the COVID-19 pandemic.

8%

of seafarers strongly agreed with the statement *'I feel valued in my role'.*

13%

of seafarers felt they were performing an essential role during the COVID-19 pandemic.

→ **Read the full press release.**

Find out further insights from the survey

Mental and physical well-being

When asked to rate support on mental and physical well-being during this pandemic: with 1 being poor and 10 excellent, the mean result was 6.29, suggesting that while a lot of companies have provided ample support during the pandemic, there is still room for improvement. There were marked differences in support for seagoing versus land-based employees and serious concerns were also raised over seafarer mental health, communications and disease management, with key findings including:

75%

of seafarers stated the pandemic meant they were not receiving regular visits from shoreside personnel

62%

of seafarers felt their health and safety was not being balanced appropriately with operational demands

54%

of seafarers felt they were not being actively helped to manage stress and fatigue during the pandemic

Reasons ship staff gave for not seeking help was the stigma surrounding mental health and concerns it could hurt their employment. Others said they felt there was no need to, that they had support from their family or, worryingly, that they did not think it would be effective.

There are measures that maritime organisations can put in place to better support their staff's wellbeing, including, as Springett advised, distributing the information of other organisations, seafarer charities, and more general mental health charities that provide confidential support. The UK Chamber of Shipping has free a guideline, 'Guidelines to shipping companies on mental health awareness', that can be downloaded online for shipping companies to create a seafarer mental welfare policy.

Meanwhile, Stokes said to tackle the stigma around mental wellbeing within the maritime industry, "tailored communications, initiatives, and training" should be provided for seafarers and shore staff, for employees and managers alike. This could include:

- Providing a mental health first aider training for a group of employees
- Providing regular updates on the importance of mental and physical wellbeing
- Providing e-learning about mental wellbeing
- Providing more posters, flashes to increase awareness of mental wellbeing
- Posting all the free and confidential mental wellbeing helplines on board ships
- Creating a video/podcast campaign to include seafarers talking about their own mental health, and company CEOs talking about its importance

Meanwhile, Bailey said the seafarer charity is promoting the idea of "mental health champions" on board every ship so that seafarers have access to resources which "empower them to make positive decisions about their own mental health and wellbeing". MtS sees

"The fact that so many countries have yet to designate seafarers as key workers suggests that they have lost the sense of urgency to support those who keep them in the lifestyles to which they are accustomed.

I was left in a Brazilian hotel room for three weeks. Not allowed out of the room and given three meals a day with very little choice. I had no access to Wi-Fi, TV, or phone services.

this as a precursor to mandating mental health training as part of the International Convention on Standards of Training, Certification and Watchkeeping for Seafarers code. “The issue should be given as much importance as firefighting and basic first aid,” said Bailey.

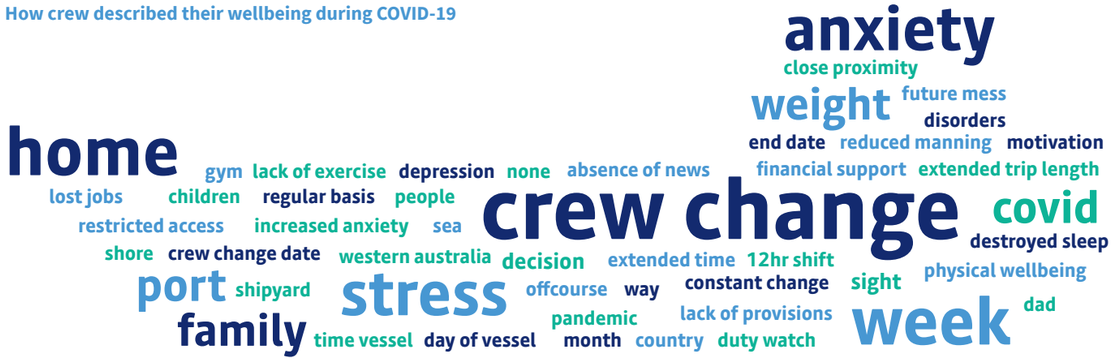
The right message

The LR survey also found that respondents, particularly ship staff, noted issues with their organisation’s communication. Nineteen per cent of ship staff strongly disagreed that their company answers staff questions and concerns quickly and in full, compared with 12% of shore staff. Meanwhile, 15% of ship staff strongly disagreed that the company effectively communicates the reasons behind any COVID-19-related actions taken, compared with 11% for shore staff. Furthermore, 18% said they strongly disagreed that actions are taken promptly when wellbeing concerns are raised, compared with 13% of shore staff. This could well be behind a differing perception from sea to shore over how their organisations are handling the wellbeing crisis: 17% of ship staff strongly disagree their organisation is handling the crisis well, compared with 10% of shore staff.

Respondents commented that company communication varied, with some stating it had been slow to start but that regular communications from senior managers had become more regular, while others wrote highly critical reviews. One such review stated, “Communication could not have been worse. Most of the time, there is no communication. People are left to gossip on social media to try and figure out company policies or crew change dates. What little official communication there is haphazard, contradictory, fragmented, illogical, and selectively distributed. It’s a huge mess.” Regardless whether the comments were positive or negative, the resounding message was that companies could be doing more to better communicate to their staff, especially those at sea.

Springett did sound a note of logic to these issues, stating that companies are not always able to access reliable information that they can pass onto their crew and do not want to make false promises, especially regarding repatriation. “In our experience with companies, they are trying to go the extra mile to keep crew and families informed,” he added. Bailey echoed Springett’s comments that

How crew described their wellbeing during COVID-19



the industry has done the best it can to keep families and loved ones updated, given the unprecedented situation but that there would be “lessons to learn”. On a practical note, Stokes said there are multiple methods for companies to ensure communication is improved. It should not necessarily mean upping the rate of communications but rather on improving the quality. “It is important that the company takes time to explain why decisions are being made and what these are based on. This does not have to be an in-depth explanation, but needs to enable seafarers to feel they are being treated fairly, and their welfare has been considered. Also, that the logic behind the decision is well thought out for everyone’s benefit,” said Stokes. “The company needs to bring employees with them on the journey, not make the employee feel that it is being done to them.”

Stokes suggested soft skills training could be implemented for those responsible for communicating key messages. Furthermore, she said that companies should take responsibility to provide regular updates regarding the COVID-19 precautions being taken, the measures that are in place, and what they are doing to embark and disembark crew members safely. This could be clearly published on the website and sent in newsletters to families. “Importantly, individual crew members should be able to freely communicate with their family, with no impedance from limited bandwidth at sea,” Stokes concluded.

Being able to communicate with loved ones during this time is vital for crew morale and wellbeing, but the LR survey shows there is room for improvement here. Thirteen per cent of ship staff strongly disagreed that internet connections enable them to talk to friends and family, and worryingly 19% strongly disagreed that internet connections enable them to complete work tasks. This is compared with 6% and 7% respectively for shore staff. This should be a time when maritime organisations consider upping the Wi-Fi allowance for vessels, and many have done so. However, some respondents have had a different experience. “Access to decent internet and phone would significantly relieve the stress and fatigue that seafarers are now burdened with,” one respondent wrote. “However, the company has in fact lowered the bandwidth available and not all crew have access to computers. Wi-Fi must be made available for all.”

Disease management and treatment

Of those asked, 5% said there had been a confirmed diagnosis of COVID-19 on their vessel or in their place of work. A further 1% said they had received a positive COVID-19 diagnosis. “I myself tested positive for COVID-19. Out of a crew of 95, almost one-third of the crew tested positive. Many of those of certain nationalities where then fired after recovering,” one respondent wrote. When asked how they felt about going back to work after being diagnosed and undergoing quarantine, a seafarer wrote, “There was no support from [my company]. Not one email asking how I was. I was left in a Brazilian hotel room for three weeks. Not allowed out of the room and given three meals a day with very little choice. I had no access to Wi-Fi, tv, or phone services.”

Of course, these are anecdotal responses and there are many maritime companies getting it right and looking after their staff well during and after quarantine. However, such anecdotes are still cause for concern. Stokes noted it would be useful if the ILO updates the MLC regulation to define the responsibilities of companies during quarantine periods to make sure seafarers are treated fairly. Anyone returning to work after a long break or illness must be supported by its company. However, Stokes said that a phased return to work was not possible for seafarers.

Therefore, consideration must be given to those returning to sea as fatigue levels will likely be higher in the first few weeks. Propensity for human error will also likely be higher, suggested Stokes, so additional support or hours off should be considered. “Perhaps doubling manpower for a short period or increasing handover durations would support this transition, where cabin space and social distancing allows,” she said, adding that these measures can also support those crew on COVID-19 extended contracts by shortening their work hours for the last two weeks.

Quarantine measures should be in place for embarking crew to avoid them contracting COVID-19, she added. Unfortunately, at the time of writing there is little sign of the pandemic easing off any time soon, nor the stresses or strains for seafarers or those onshore tasked with supporting them. This is why it is vital for maritime to continually review its response and act swiftly on the feedback from its staff and surveys like LR’s to ensure that it can responsibly and ethically continue to operate.

This article was originally published by Safety at Sea.

Surveying views from the maritime workforce.

Crew feel they are ‘not essential’ during COVID-19.

As the international crew change crisis drags on amid the COVID-19 pandemic, crew morale is low as seafarers feel that they are not being recognised as essential workers by many governments.

The IMO estimates that 400,000 seafarers from across the globe are now working beyond their contractual period on ships, a trend that could take a toll on the crew’s mental health.

The LR survey showed that 25% of respondents answering: “strongly disagree” “disagree” and “somewhat disagree” as to whether they felt they were performing an essential role during the pandemic.

IMO, ILO and International Civil Aviation Organization issued a joint statement on the designation of seafarers and air personnel as key workers in May 2020.

As of mid-August, 42 countries recognised seafarers as key workers.

LR’s senior principal human factors consultant, Jo Stokes said: “For the rest of the countries to do so, there is a need for further political and public pressure to be placed on the remaining countries.”

Mid-year, India, the Philippines, Dubai and Singapore, were among the minority of countries that re-opened their ports to allow crew change. Australia has gone further, detaining ships whose crew have worked beyond their contractual period.

However, such actions are not happening on a large scale, leading some seafarers to feel cast aside by governments.

One survey respondent wrote: “I feel abandoned by my own government.

→ **Read full story.**

Insufficient crew health provisions amid the pandemic.

The needs of crews’ mental health and physical health are not being met during the COVID-19 pandemic, according to findings from the LR survey.

The needs of crews’ mental health and physical health are not being met during the COVID-19 pandemic, according to findings from the LR survey.

Many crew members responding to the survey said there is little support provided by their companies for mental health.

Half of the seafarers surveyed said that neither a counsellor nor a welfare officer is available to provide professional advice and support. The disparity was more obvious among shore staff, with 68% saying that there was nobody they could turn to.

The pandemic’s effects on seafarers’ mental health were highlighted when some of cruise ship Diamond Princess’ crew members reportedly took to the Internet to vent their frustrations.

Diamond Princess, one of the many cruise ships to be affected by the pandemic, was quarantined in Yokohama, Japan, from 5 to 19 February 2020, because a former passenger had tested positive for COVID-19.

By the time the quarantine ended, there were 621 infections among the more than 3,700 passengers and crew, which dominated both the trade and mainstream press. Three of the passengers, all elderly persons with underlying health conditions, died.

However, the Japanese government obliged the 1,000 or so crew members to undergo a 14-day quarantine, as they worked while the passengers were confined to their cabins, in order to keep the ship running.

For those that do have access to mental health support, seafarers reported a low uptake due to the stigmatism of mental health and fears of losing their jobs.

→ **Read full story.**

Crew treatment during pandemic raises concerns.

Reports of crew being fired after COVID-19 diagnoses raises concerns over the treatment of crew during the pandemic.

Five percent of crew respondents said that there had been a case of COVID-19 on board their vessel. One seafarer responding to the survey wrote: “Out of a crew of 95, almost one-third of the crew tested positive. Many of those of certain nationalities were then fired after recovering.”

Provisions for looking after crew during treatment or quarantine is also worrying. One crew member wrote: “Most crew infected or recovers, overall [feeling] onboard is one of fear, stress and worthlessness.” It is unclear whose responsibility it is to look after crew members who have disembarked and are left to quarantine in hotels and some reported not being paid during this time.

LR’s senior principal human factors consultant, Jo Stokes thinks that shipowners or managers should be responsible for the seafarers all the way.

She said, “If a person tests positive and needs to go into quarantine, it should be the responsibility of the company to cover the expenses occurred during that period (hotel, food, etc.) and to pay salary for that duration.”

Stokes added that it would help if the ILO updates the Maritime Labour Convention to define the responsibilities of companies during the quarantine periods to make sure seafarers are treated fairly. The situation is not any better for those hoping to resume work following quarantine, due to a lack of pastoral care from their companies.

One seafarer wrote: “There was no support from [my company]. Not one email asking how I was etc. I was left in a Brazilian hotel room for three weeks. Not allowed out of the room and given three meals a day, with very little choice. I had no access to Wi-Fi, television or phone services.”

→ **Read full story.**

Crew unhappiness widespread amid COVID-19.

Crew responding to the LR survey have reported feeling unhappy, worry about things they cannot control and do not feel well rested.

27 percent of respondents indicated poor management of workload and fatigue in their teams and not being able to get a good quality of sleep.

Furthermore, they also report not socialising on board, not being able to exercise as much as they would like to and not having access to good quality food.

The latest Mission to Seafarers’ Happiness Index, which is conducted every three months, appears to corroborate the LR survey results.

Released in October 2020, the latest Seafarers Happiness Index showed that the ongoing crew change crisis has chipped away at seafarers’ hopes for action to resolve the impact of extended employment contracts.

Although the index went up to 6.35, from 6.18 for the second quarter of 2020, the scores dropped as the third quarter progressed.

Mission to Seafarers’ Secretary General Andrew Wright commented, “Once again, the Seafarers Happiness Index has revealed the immense human cost of the COVID-19 pandemic among the men and women who serve at sea and upon whom we all depend. It is deeply worrying to learn of the impact on the bonds between crewmates and the damage to social cohesion on board.

“All of us who care about our seafarers must act now and act faster to deliver the immediate support and relief that they need, along with a longer-term plan of action; one that meets the needs of those serving at sea and those stranded ashore.”

→ **Read full story.**

Further insights from the survey.
Visit the wellbeing survey homepage for more insights:
lr.org/en/insights/seafarer-survey

What does the future hold for safetytech in marine?

A Q&A with Andy McKeran, LR Marine and Offshore Commercial Director.

How has safetytech evolved in marine on your 20+ years in the industry? What are your views on acceptance and industry uptake?

The pace at which technology has taken hold in maritime has surpassed the expectations of many players in the industry. 2020 has been a year where this uptake has particularly accelerated, given the challenges presented by the COVID-19 pandemic. Technology is deployed routinely across maritime for a variety of use cases from ship design and ship building, oil and gas production, transport logistics and economics, to technology for the protection of the marine environment. Perhaps what we do not see as widely used as we would like to in marine, is safetytech. Industry uptake and acceptance has only just begun for this new sector. For those unfamiliar, safetytech is the collective term for technology, products and services that are starting to significantly enhance safety management in safety-critical industries and infrastructure.

Recent research carried out by LR Foundation has found that the combined global safetytech market is expected to be worth $863 billion in the next three years and for safety critical industries alone, it is expected to be at least $257 billion. When we look at this through the lens of the marine industry, it is expected that the maritime safetytech market will grow to approximately $6.6 billion by 2023, with a compound annual growth rate of 7.7%.

There really is no question that the appetite and acceptance of new technologies has taken hold and continues to take hold and in fact is expected to accelerate rapidly, for safetytech in particular.

What are the biggest safety challenges in maritime? Have these changed? What efforts are underway to address them? What else needs to happen?

The peril of the sea is well-known and has of course been much debated and analysed over the years. Seafarer lives are lost annually, despite industry best-efforts to improve safety. Marine casualties are oftentimes frustratingly out of our control, despite the many processes and safety measures in place. Extreme weather, freak accidents, human error – these things are difficult to predict and mitigate. However, innovative technology can enhance our processes and reduce danger in day-to-day operations. Things like drones and sensors can ensure that the human is removed altogether from carrying out hazardous tasks or inspections, such as those at height, extreme locations, or confined spaces, or spaces those with life threatening substances.

Human performance is dynamic, and decisions are often made based on real-time conditions, on the spot. When physical demands or challenging conditions impact people's ability to carry out their job effectively and safely, technology can complement the work of the engineer onboard, making the

Many startups within accelerators have been working on their technology solutions, fine-tuning for quite some time, often across various industries and verticals, learning, adapting, sharing, and growing.

work more effective, less challenging, and altogether safer. Mechanical and software technologies, including advanced automation, can reduce workload and stress, removing overtly difficult or dangerous work.

Technology can also be used to assess when to put people to work – are the crew fit and well-rested and ready to perform? Many of us already use wearables in our everyday lives, to monitor our activity, heartrate, and sleep patterns. This technology can also be used to sound the alarm in safety-critical industries when people are tired, and their performance could create risk to themselves or others. Using data on fatigue, eye-hand co-ordination etc. can pull people out of dangerous situations and help employers identify patterns of performance and isolate risk hotspots.

A great example of ensuring the safety of seafarers is the technology being developed by LR's Safety Accelerator startup graduate Senseye, who worked in partnership with Pacific International Lines through the programme. Their smart technology scans the retina of the eye, using off-the-shelf cameras, to detect if crew on board are 'fit for duty'. This essentially means whether they are fatigued, or are impaired in some way from safely carrying out their job, which could be as a result of stress, depression or having consumed alcohol or drugs. This type of solution, if deployed widely in maritime, could drastically reduce safety incidents caused by human error.

Aside from the importance of technology enhancing human safety, it can be used to make us like our work more and help us feel more positive about it. Minimising administrative tasks leaves more room for us to the less menial, exciting, hands-on work that we prefer.

Looking at digitalisation in maritime – any views on Accelerators, incubators and startups? What role do they play? How do you see this changing? What challenges do they face?

Accelerators give corporations unfiltered access to highly skilled, yet to be tapped into, talent pools outside of their everyday supply chain. There are no off-the-shelf solutions, only cutting-edge innovation ripe for the picking. For corporations, working with an Accelerator or startup spurs innovation and ensures competitivity in a rapidly modernising world.

Tunnel-vision can easily happen, particularly in an industry like maritime, with the focus remaining on everyday operations rather than innovation and outside-the-box thinking. When startups team up with global corporate partners, they have a wealth of new opportunities that will help them grow.

The knowledge that we can gain from those working in a slightly different space or environment is staggering. Many startups within accelerators have been working on their technology solutions, fine-tuning for quite some time, often across various industries and verticals, learning, adapting, sharing, and growing. Knowledge is power and we can interpret and transform these insights into real world action across sectors and industries.

For large corporations, the exposure to ground-breaking tech and modern methodologies gives them access and insight into emerging market trends, as well as the opportunity to forge relationships with promising early stage startups.

I think the perceived risk for trying out something new and 'taking a chance' on a new solution that is fresh to market is the biggest challenge faced by Accelerators. What we have seen at LR with our award-winning Safety Accelerator is that by funding and guiding the innovation trial between the startup and the corporation, we essentially remove the barrier of the perceived risk. Both parties are fully open and immersed in the technology collaboration because they have the safety net and guidance of LR experts at the helm of the project.

People are the lifeblood of maritime, how do they engage with safetytech? Are there any cultural or operational issues that need to be overcome? How can the industry better embrace safetytech?

The positives from these technologies are easy to see, but there are still some negatives that require navigation. There are data protection and privacy issues and there is need to assure confidentiality both for reporting of things that concern people and for them seeking assistance is important. One must also factor in cyber security.

However, the fact that we know about these risks, we can share the data with industry and a variety of stakeholders can tackle these challenges and make the industry safer for everyone. It really is a no-brainer; we must embrace safetytech in maritime to save lives.

Is video analytics the answer to safer ships and safer seas?

Maritime industry experts and innovative technologists explored the benefits of video analytics for safety in maritime, during the Lloyd's Register Safety Accelerator webinar, hosted by Lloyd's List, earlier this month.

Now more than ever, safety is ripe for digital transformation and disruption. This disruption will require not just an influx of ground-breaking new technologies, but reshaping industry culture, revamping training and even revising traditional processes, in order to effect real change.

One such technology beginning to transform and disrupt how safety and risk is managed in safety-critical industries, such as maritime, is video analytics. It can be used to detect or even predict unsafe situations, spot unintentional operator errors, or avoid future accidents, by analysing historical events. While it has been used extensively in a range of applications in various industries, its use in maritime is still in its infancy.

During the Lloyd's Register Safety Accelerator webinar on 3 December, maritime experts Andy McKeran, LR's Marine and Offshore Commercial Director, and Nick Chubb, Founder of Thetius, an organisation dedicated to enabling maritime innovation, explored how we might accelerate the uptake of safetytech in marine, delving into barriers and opportunities, as well as potential use cases of video analytics in the industry.

The session also featured exclusive showcases from leading video analytics technology companies, who are working with the Safety Accelerator to solve important safety challenges in maritime and beyond.

Dr. Maurizio Pilu, VP for Digital Innovation at LR, who has a PhD in AI and Computer Vision and has worked with these technologies for many years explains, "It was interesting to hear at the event how maritime veterans feel that video analytics can be a real breakthrough in increasing safety and managing risk."

During the event, the three video analytics companies presented their technologies and the client pilots they undertook through the Safety Accelerator. Senseye, who completed a pilot with Pacific International Lines in Singapore, uses technology that is also being trialled with jet fighter pilots, to assess (in just a few seconds) fatigue, or other potentially risky conditions of seafarers, before they go out on duty.

Sensing Feeling, who is trialling their privacy-by-design visual analytics technology in the retail sector, is working with bulk and tanker ship manager Scorpio, to study if patterns of behaviour on a bridge correlate with unsafe situations.

Lastly, IronYun plans to deploy a video analytics solution in a port environment to allow the end-user to configure their own real-time safety monitoring applications, thereby putting the power of AI in the hands of HSE professionals.

> **It was interesting to hear at the event how maritime veterans feel that video analytics can be a real breakthrough in increasing safety and managing risk.**

Dr. Maurizio Pilu
VP for Digital Innovation at LR

Maritime companies Scorpio and Wallenius Wilhelmsen also shared their journey with the Safety Accelerator, as well as their experiences and insights on digital innovation for safety, during the webinar. They were joined by Seaspan, who examined how we can all work together to pioneer safety innovations in marine and make a real difference in industry.

Dr. Pilu says, "It was really promising to hear one of the maritime companies that engaged with the Accelerator saying that working with early stage cutting edge tech companies went from being a 'nice to have' to a 'must have' and how working on their Accelerator pilot opened up a number of possibilities."

"It's quite clear that the potential is substantial – but more work is needed around privacy and trust and we are pleased that early-stage technology companies and clients alike believe that initiatives such as the Safety Accelerator can help create awareness and hands-on proof points, to resolve these issues for the industry," Dr. Pilu reflected further on the learnings form the event.

In the past two years, LR's award-winning Safety Accelerator has engaged with more than 600 start-ups and tackled 16 global safety and risk pilot projects with leading companies, or 'Challenge Partners', including Wallenius Wilhelmsen, Scorpio, Bernhard Schulte Shipmanagement, Seaspan, Shell, Benugo, HSE, KOTUG, PIL and many more, who have trialled innovative solutions from early-stage digital companies at their sites, ranging from sensor technology, machine leaning, AI and computer vision systems and data analytics.

The Safety Accelerator is launching a new batch of Open Innovation Challenges in January and is seeking industry leaders, or 'Challenge Partners', to engage with the programme, to tackle their biggest safety and risk challenges. The team would love to hear from you, so if you'd like to learn more, or would like the Accelerator to solve your safety challenge, visit **their webpage**, or email **maurizio.pilu@lr.org**.

Alastair on:

His favourite vessel types

Commercial tonnage is fascinating, especially some of the highly specialised ships but the naval vessels are the ones I love – it's the scale and technology. The two aircraft carriers – Queen Elizabeth and the Prince of Wales – are just magnificent and I am so proud of LR's involvement with these projects and being able to work with the Royal Navy.

Most hair-raising moment

"Being handed the controls of an oceangoing tug on a choppy River Forth without prior warning from its owner, a potential client looked on."

His career

Few people's careers turn out as they imagine. I never set out to be a chief executive and I had always thought I would spend my career exclusively in finance. To have spent nearly a third of my career at one company was totally unexpected and is a sign of how much I have enjoyed my time at LR.

→ Read more:
www.lr.org/en/insights/articles/alastair-marsh-drive-focused-effective-action/

All change.

LR is a very different company to the one Alastair Marsh first encountered when he joined in 2007. As he signs off on his 14-year tenure, five of which leading the organisation as CEO, he shares his reflections.

Words by Nicola Good

Rising to the challenges of the COVID-19 pandemic, involving "months of really tough, high intensity work" to navigate the impact of lockdowns and travel restrictions on LR's global professional services business, will stay fresh in the memory of outgoing LR Chief Executive Alastair Marsh for many years to come.

2020 has been a testing year for business leaders worldwide and the Scotsman, who picked up the virus while skiing in Austria in early March, was just getting back on his feet when the UK lockdown was announced – an event he remembers clearly as it triggered the start of a demanding period with the organisation having to coordinate its response to COVID-19 infection around the world and the potential impact on its people and operations.

"Just trying to get our arms around what it meant for the business and how bad it could become was difficult," he tells Horizons. "We had to focus on the financial implications over one month, three months, six months and a year, and it went back to real basics, managing resources and cashflow. There was even greater complexity when governments set out their guidelines and financial support and we had to understand what this meant for us."

According to Marsh, LR got to grips with things quickly. Central group functions and business streams pulled together, and across the organisation, multiple teams embraced remote service options and enhanced their existing capabilities to support clients dealing with unexpected scenarios.

"We proved that we can be very, very resilient but also very creative as well. And this underpins what I tried to set out to do in 2016 – to make LR a more agile organisation with digitalised capability at its core and one with fewer silos.

"Much of the work of the past four or five years was put into action as we had no choice but to look at different ways of working. The implementation of new IT systems was a saviour because if they hadn't been in place our employees couldn't have adapted as easily to remote working," he adds.

Marsh is quick to stress he doesn't see a lot going back 100% to the way it operated before. How much things will change, however, remains to be seen. People won't be officed-based every day of the week though but face-to face meetings will return as "our business is relationship-driven. It is important for us to get back to travelling as there's no substitute for in person meetings with key clients, particularly in Asia", he says.

Another significant event in 2020 was the sale of LR's energy business – now operating as Vysus – in October to Inspirit Capital, a London-based private equity firm. The successful sale, says Marsh, was an indicator of the energy business' resilience throughout COVID-19 and during periods of extended oil price volatility. The decision to sell had followed a thorough review of options for the whole group and after much action to set the energy business up for future success early in 2019 after several challenging years.

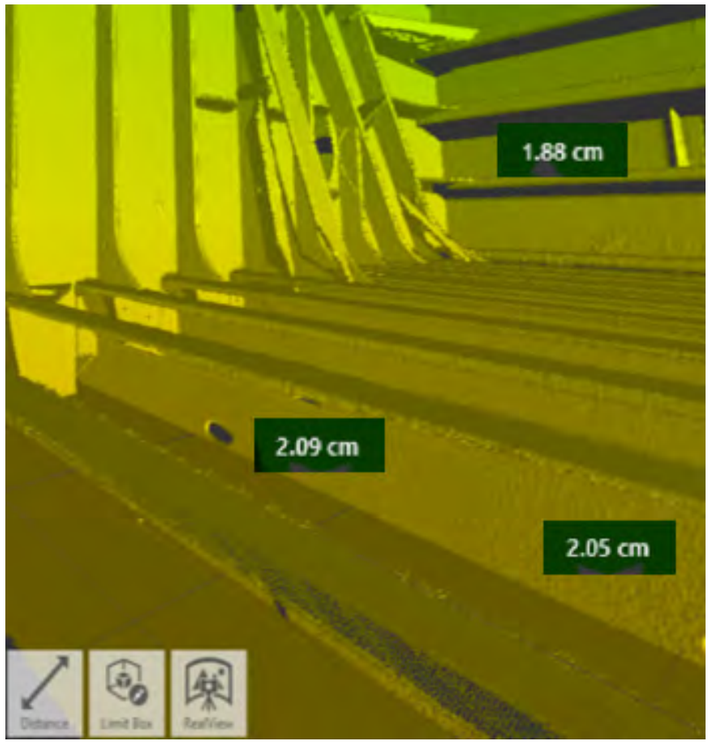
There is no questioning Marsh's drive and ambition – although he admits that he probably pushed himself too hard too soon after his COVID-19 recovery – and LR is "unrecognisable" from the company he joined in 2007. There has been the creation of the Foundation and Group in 2012 which gave clarity over the remit of the two entities and reinforced the shared purpose to make the world a safer place. There has been huge investment in digital systems and more recently greater working life flexibility than ever before with the introduction of LR's New Way of Working programme. Despite these seismic changes, the "best bits of LR – its safety culture, the recognition of legacy and the determination of its people to solve complex problems remain firmly intact".

> **We proved that we can be very, very resilient but also very creative as well.**

So, any advice for his successor Marine and Offshore Director Nick Brown? "Nick knows LR inside and out and we have always worked well together. Like me he recognises that the pace of change is accelerating, and we need to be ready to respond. In terms of handover, it's been a steady transition albeit a dynamic one. I have focused on the short-term issues and handed over the decisions that affect the period beyond the end of the year when he's going to be running the company."

According to Marsh stepping into the CEOs shoes was challenging because of the absence of a digital strategy when he found himself at the helm. "Competitors had seen the digital change coming sooner than we had at LR and we were ill-prepared. We have worked incredibly hard to address this and have been able to avoid some of the mistakes that early adopters made. AllAssets and i4 Insight are part of a strong digital foundation and LR will reap the dividends of this investment in the future. All this will make for a busy start for Nick as he shapes his strategy for LR."

For Marsh the beginning of 2021 is likely to be a lot more relaxing, with an extended holiday planned before deciding what he does next. A few non-executive roles are under consideration, but he stresses that he will keep his options open until the right opportunities come up. There is one wish though, he tells Horizons, he's keen to stay in shipping…




Images courtesy of EM&I Alliance.

The evolving world of inspection technology.

Inspection providers are making tank inspections safer and maintenance and survey schedules more effective with each innovation. But how does Class fit into all of this? And are these technologies equivalent to a surveyor inspecting a tank?

Words by Viv Lebbon

Technological advances are improving the safety of tank inspections by limiting the need for human entry into dangerous conditions. Robotically-operated cameras, for example, can also offer better imagery and data about an asset, feeding into the risk-based inspection (RBI) plan, helping class societies and operators understand the state of their asset, improve planned maintenance schedules and in some cases extend the life of an asset. But are these new innovations safe? And are they accepted by class societies and regulators? Important questions raised by operators as we move towards a more digitalised world.

For many years, LR has been working with clients and different technology vendors in the use of remote inspection techniques (RIT), including drones and cameras, on surveys and in developing the equipment. In this article, we focus on one vendor in particular, EM&I Alliance Group, and its 'NoMan' camera, and how the company's technology has changed the way the industry approaches tank inspections, LR's involvement in making the technology suitable for surveyors and operators, and what the future holds for this technology.

As many will know, tanks are large, dark spaces with structure that is not easily accessible. So, the traditional approach involved flooding tanks and inspecting via inflatable boats. "Inspection has now evolved from flooding tanks to scaffolding, rope access and walkways, all of which are time consuming, expensive and have multiple safety risks associated with them as they involve putting people into confined, dangerous spaces," noted Constantinis.

"Before scaffolding or rope access was set up, crew members needed to make sure the tank was suitable for personnel to enter, ensuring the tank was gas-free and cleaned so areas were visible and accessible, for example." Meaning that all approaches took a considerable amount of time and effort to perform, with the end-to-end process on average lasting up to ten days with approx. 8-9 people on hand to support, not including the inspection itself and any follow-on actions.

"As time went on and technology progressed, robotically-operated cameras were introduced to reduce the time it took to enter and inspect a tank", Constantinis commented. With this, EM&I Alliance Group developed its robotically-operated 'NoMan camera' to enable the company, operators and surveyors to have a general overview of the tank, coatings and structural damage or corrosion. The high performance camera positioned on a carbon-fibre pole has zoom capabilities of up to 30-metres so it can provide a closer look at specific areas. It also has sufficient manoeuvrability allowing the camera to get into confined places within a tank onboard an FPSO.

The NoMan camera's control unit and screen is protected by a habitat, an enclosure in which non-explosion proof equipment can be used within a hazardous area, which makes the camera gas safe and suitable to enter tanks onboard nuclear platforms as well as traditional offshore assets. The camera, which has its own lighting, is controlled

EM&I's ambition going forward is to develop software or some sort artificial intelligence which will recognise and eventually predict patterns over time, such as coating damage, instead of reviewing hours and hours of video.

by an EM&I operator outside of the tank and is technically regarded as a 'remote' form of technology, meaning surveyors and crew members do not need to enter the confined space, improving the safety of the activity and importantly, limiting the need for physical entry, and working at height, taking personnel out of an unnecessary hazardous situation.

"When using the NoMan camera, the tank still needs to be cleaned but only to remove excess sludge, making sure areas of concern are visible rather than preparing it for human entry, which can save the operator and its crew time on preparation and planning ahead of the inspection."

So, what about Class?

In line with LR's key role in the offshore world – ensuring floating assets are fit for purpose from construction, in-service to decommissioning – LR worked with EM&I to provide a basis of 'what good looks like' for the NoMan camera, outlining what needs to be inspected and at what level of detail, as the camera's results directly feeds into the RBI plan agreed for that specific facility.

Providing a greater level of insight and data about the tank, the NoMan camera can also improve LR's and the operator's understanding of that specific facility, enabling better decisions around planned maintenance, by looking at specific areas rather than the entire asset, and if appropriate extend the life of an asset when it comes to redeployment.

A collaborative approach

LR is also part of HITS joint industry project (JIP) which is an international initiative that aims to improve the way the industry manages the integrity of marine structures such as FPSOs, FSRUs, FLNGs and other floating offshore assets. The JIP is now in its seventh phase which looks to stop human entry for tank inspections, through technologies such as the NoMan camera. Founded by EM&I in 2011, HITS is supported by operators, regulators, classification societies as well as service providers and has successfully delivered industry innovations and guidance related to improving hull inspection, enabling shared knowledge throughout the industry and awareness around key issues.

How does it work?

Throughout the inspection, a surveyor located outside of the tank instructs the EM&I camera operator of the specific areas that need to be inspected. Referring to the agreed RBI plan for that facility, the surveyor can identify areas they suspect to be corroded or cracked, for example. If this is not the case, it could postpone maintenance. Alternatively, if more corrosion is found, surveyors and crew can expediate repairs and maintenance, enabling the operator to make robust decisions and plan effective maintenance, all of which having limited impact on operations.

"This leads to a very focused inspection, rather than inspecting the whole tank, the traditional way, making the process more efficient – saving time and money for the operator," said Constantinis.

By using the NoMan camera, surveyors and crew can take stills that capture the exact time, date and location within the tank, providing realistic depictions that can be used for comparison at a future inspection by a different LR surveyor and inform decision-making by the operator at a later stage if repairs are needed.

"Ongoing developments of NoMan include specialised laser scanning cameras which will provide additional information on structural condition" added Constantinis.

Next steps

Currently, the NoMan camera can provide surveyors with a clear view of the inside of the tank but it cannot measure thickness or the distortion of components – so determining how thick a metal plate is or whether it's getting thinner or is starting to bend cannot be performed by NoMan.

EM&I are now developing synchronous laser scanning technology for the NoMan camera system which can scan the tank and provide distortion information and thickness readings. This dimensional information can then be used by surveyors to understand the state of the tank, identify corrosion or other damage and determine which materials/areas/equipment need to be replaced. Importantly, by providing realistic data, the NoMan camera can help surveyors and operators understand the structural integrity of the facility, by feeding into the asset's RBI plan, making planned maintenance more efficient.

From a class perspective, LR will provide guidance to EM&I on what areas of the tank need to be inspected using the synchronous laser scanning technology and the correct data needed by surveyors to determine if there's any corrosion or damage. This is in alignment with LR's guide, "Remote Inspection Technique Systems (RITS) Assessment Standard for use on LR Class Surveys of Steel Structure", which sets out LR's expectations on what RITS such as the synchronous laser scanning technology should achieve. If approved, operators will see through LR's third-party validation that the technology is doing what it's supposed to do, and regulators can see that LR and EM&I continue to work in line with best practice, industry standards and latest guidance associated with hull integrity and tank inspection.

From a regulatory perspective, LR continues to work with regulators to ensure they have confidence in the latest inspection technologies, which are in line with LR's RITS Assessment Standard and consequently, the offshore industry makes progressive steps to ensure assets are verified as safe while where possible also remove personnel from hazardous environments.

By utilising data from technology such as the NoMan camera and synchronous laser scanning, class societies, inspection companies and operators should reach a point where all parties involved can see patterns over time, significant structural issues with the design, for example, and actually determine what the change means rather than see change simply occurring.

As to the future, Constantinis is optimistic about the NoMan camera system. "EM&I's ambition going forward is to develop software or some sort artificial intelligence which will recognise and eventually predict patterns over time, such as coating damage, instead of reviewing hours and hours of video."

Going forward, this data will support the offshore industry's eventual move to artificial intelligence and digital twins, informing key decision-making with regards to potential redeployment opportunities and life extension.

From a surveyor perspective...

EM&I Alliance's NoMan camera's live-feed has a high resolution and is stable, unlike a drone, so our surveyors can see the tank clearly, whereby we can stop the camera operator at any point and zoom in to see defects or other issues.

The NoMan camera can inspect small openings, travel down to lower parts of the tank and provide a 360 view, helping LR surveyors see the general condition of the tank. Following the remote inspection, if personnel or surveyors need to enter the tank, they can focus on specific areas keeping the visit focused and concise, saving time and thus minimising exposure to hazards in tank entries.

In line with the asset's RBI plan, operators and class societies might not need to perform a standard, prescriptive five-yearly inspection if the NoMan camera can be used to inspect the tank more regularly in order to get a feel for the overall state of the tank.

Provided the tank is in good condition and meets the surveyor's expectations, there is potential on some occasions that human entry is not required as the camera can provide detailed images to a surveyor.

Obviously, considerations must be taken into account beforehand, for example, Rule requirements for thickness measurements which cannot be performed by the NoMan camera at the moment, so physical attendance is still necessary for some surveys, and should be considered as part of the remote inspection plan.

Operators and surveyors can also use NoMan to prepare for repairs; taking images and videos to determine the size of the area, identify repair and then get relevant permits and equipment. This is cost effective for operators, as the impact of getting into a tank onboard a FPSO, for example, is expensive and can have a significant impact on operations.

Matt Tillman
Offshore & Statutory TSO Manager, UK&I

Leading the way in remote surveys.

LR completes first ever full annual survey remotely and receives approval from the Maritime and Port Authority of Singapore to carry out remote surveys on overseas, Singapore-flagged pleasure craft.

Reliance on remote capability surged as COVID-19 restricted global movement. Access challenges have since been eased cautiously, but with certain travel restrictions still in place, we take a look at a number of recent remote survey success stories.

Throughout 2020, LR has grown its remote survey offering to support our customers, and now, 1 in 3 of the 30,000+ surveys we perform each year is completed without physical attendance. When used in appropriate scenarios, remote surveys hold great value for LR and our clients as a time-efficient solution when vessels are inaccessible or extremely remote. By offering streamlined decision-making through real-time livestreams with surveyors and other stakeholders including flag States, remote surveyors enable immediate feedback and transparency.

At the end of October, LR surveyors in Singapore carried out a remote renewal survey on a Singapore-flagged yacht located in Phuket, Thailand. A remote solution was required as the vessel's certificate validity was expiring, and due to travel restrictions, the vessel was still inaccessible.

Following engagement with the yacht owner's representative and the Maritime and Port Authority of Singapore (MPA) team, all parties downloaded the LR Remote app so that they could view the survey livestream in real-time. The full renewal remote survey was then carried out using the LR Remote app to livestream and record videos/photos, which provided a complete picture of the vessel for the LR surveyors to review.

LR received MPA's support for remote surveying following a demonstration of its capabilities. MPA accepted LR's robust procedures and surveyor guidelines for performing remote surveys, which led to the approval for LR to carry out remote surveys for Singapore-registered pleasure craft on a case-by-case basis.

LR's remote surveying capability has been of great assistance to MPA. With many pleasure craft operating outside the Port of Singapore, there was a clear need for a remote solution given current travel restrictions and the approaching expiry of the validity of pleasure craft certificates.

LR has carried out hundreds of remote surveys in South East Asia and has trained 15 surveyors in the region to carry out remote surveys on pleasure craft specifically, and to date has completed remote surveys on three yachts (two in Thailand and one in Turkey), with a further five in the pipeline.

Mr Cheah Aun Aun, Deputy Director of Shipping and Marine, MPA, said: "Since the outbreak of the COVID-19 pandemic in Singapore, MPA has been consistently exploring and reviewing the technologies and operating models involved in remote survey aboard Singapore-registered ships (SRS). MPA's strong commitment to digitalisation has supported LR in combining its long-standing technical expertise with cutting-edge tools and technologies. Despite initial challenges, we have worked closely with our stakeholders, such as Recognised Organisation and SRS operators, to carry out successful remote surveys on a range of vessels. MPA will continue to support and review remote survey capabilities given that the trend of remote surveying is likely to persist as a new normal in the shipping industry."

Chris Willsher, LR's Product Manager for Compliance Systems, said: "Thanks to the collaborative capabilities of the LR Remote app and the experience of our remote survey specialists, MPA Singapore has gained substantial confidence in our remote surveying capabilities. The industry has just scratched the surface of what is possible with remote surveying techniques, but we have already seen many advantages. LR envisages that traditional physical attendance surveys will become enhanced and supplemented by remote surveys and data, using digital technology."

> **The industry has just scratched the surface of what is possible with remote surveying techniques, but we have already seen many advantages.**
>
> **Chris Willsher**
> LR's Product Manager for Compliance Systems

Full annual survey completed remotely in Canada

At the beginning of October, LR's Marine & Offshore team in the Americas completed a fully credited Class and Statutory Annual Survey for the vessel *CSL ACADIAN* using the LR Remote app. This is the first ever full annual survey that LR has completed remotely. *CSL ACADIAN* is a Panamax self-discharging bulk carrier owned by the CSL Group and managed by V.Ships USA, currently in transhipment operations on the Liberian coast.

After numerous failed attempts to arrange attendance to the vessel due to the ongoing travel restrictions, a prompt and thorough solution was required. The remote survey ensured that our surveyors could continue to support the owners in maintaining the safety and compliance of their vessel.

Gary Gallagher, LR Account Manager, North America North East, said: "This survey was the result of tremendous cooperation between the vessel management, class society and the Liberia flag Administration. It is a pivotal leap forward and this proactive approach to such challenging circumstances demonstrates LR's ability to go above and beyond in delivering our services to keep our customers and the industry running safely and efficiently."

Subodh Rebala, General Manager, V.Ships USA, said: "On behalf of V.Ships USA and CSL teams I would like to express our gratitude to the LR Teams that made this possibility a reality. It is indeed a proud moment for us to be sharing this historic first with LR. This has been a result of the concerted effort by LR, Onboard Management Team and V.Ships. It was indeed a great job done by all three teams involved. We expect this approach to get remote surveys done using technology is here to stay, and while staying within the rules & regulations, will continue post COVID."

↓ Photo of *CSL ACADIAN*, taken as part of the remote survey.

Keeping verification on-track during COVID-19.

Remote survey used for routine testing onboard Hebron, operated by ExxonMobil Canada Properties.

As part of its five-year verification program, the gravity-based offshore platform Hebron, located in Canada, was due routine testing which included cause and effect (C&E*) testing of its heating, ventilation, and air-conditioning (HVAC) system. However, given the complexities caused by COVID-19 and with suitable technology available, a remote survey was proposed instead.

To keep the verification program on track, a remote survey was successfully performed by LR to verify the C&E testing of the HVAC system on board Hebron. This enabled LR and ExxonMobil to action items on Hebron's verification scheme, which limited delays on scheduled maintenance and inspection routines onboard the platform.

By completing the survey remotely on this occasion, LR's surveyor did not have to physically travel offshore to Hebron to observe the testing, which saved time and associated costs related to travelling, i.e. delays caused by weather.

So, how did we do it?

To prepare for the testing, LR's surveyor reviewed Hebron's tracking sheets to ensure that tests are not repeated in a five-year period. From this, the type of test is selected and proposed to ExxonMobil, who review maintenance schedules and other testing onboard Hebron that could potentially hinder the testing. To prevent unnecessary downtime, an evaluation is then taken of the HVAC system in-field to determine accessibility. Upon completion, test scenarios are confirmed by the surveyor against C&E diagrams of the HVAC system – specifically its smoke and gas detection intakes.

With any testing or survey, communication is vital to ensure that each stakeholder understands the objectives behind the HVAC system C&E testing: what does a surveyor need to see/verify is working, and that the right personnel are notified. For example, testing must be approved by the Hebron production supervisor, particularly if there are temporary blocks planned on logic.

Rather than having a prescriptive list of surveys that can be performed remotely, LR surveyors evaluate each potential remote survey from a risk and safety perspective to determine the appropriateness for that particular task or survey. Therefore, a trial of the first scenario was performed before the official testing to check if the surveyor could see what they needed to see as the verifying body.

LR worked closely with Canada-Newfoundland and Labrador Offshore Petroleum Board (C-NLOPB) to provide information on LR's case-by-case approach to remote surveys, specifically around the guidance and processes when using livestreaming technologies. Members of the C-NLOPB were also invited to witness various scenarios as part of the testing, which provided a demonstration of how the technology had been applied for this specific survey.

Using video livestreaming for remote verification

In normal circumstances, a LR surveyor would attend the facility offshore, meet crew members and plan the areas/locations to be tested. The surveyor would then accompany the technician and physically check the fan and damper positions and witness smoke or gas applied to the detectors. Given the complexities of COVID-19, LR utilised the subsea fibre loop recently introduced to the Hebron platform to conduct the survey entirely remotely through ExxonMobil's preferred video telephony and online chat provider.

The livestream software enabled LR's remote surveyor to witness and verify the C&E testing of the Hebron HVAC system from his office in Newfoundland and Labrador, Canada with support from ExxonMobil's technicians and witnessed by the C-NLOPB.

The operator's technician used intrinsically-safe tablets to conduct livestreaming of the testing onboard Hebron, supported by the platform's fibre optic loop to shore and strong Wi-Fi connection. This was in conjunction with operators at the Hebron Offshore Control Room who also used tablets to livestream the platform's fire and gas panels and ICCS panels which showed the HVAC system's logic software.

Both livestreams were shown in parallel so that LR's remote surveyor could instruct ExxonMobil's infield technician performing the testing and the operator in the Offshore Control Room, real-time. Throughout the testing, LR's surveyor compared the outcomes to the platform's C&E diagrams, ensuring that each cause prompted the right effect/s.

"We're pleased that innovations we've implemented offshore Newfoundland are enhancing the safety and reliability of our operations. The introduction of the subsea fibre loop to the platform has allowed us to preserve our schedule for routine inspection and equipment testing on Hebron, despite the travel challenges associated with COVID-19," said Mike Harris, Hebron Safety, Security, Health and Environment Supervisor, ExxonMobil Canada.

While advanced technology and internet connectivity allows LR to conduct some surveys remotely, this will not replace all forms of activity as there are still some tasks that need to be witnessed and performed in person, such as general visual inspections. LR continues to review its remote verification activities on a case by case basis, ensuring that safety is paramount at every stage, without negatively impacting the quality and thoroughness of the verification services performed.

→ Find out more about Remote Surveys from LR at: **www.lr.org/en/remote-surveys/**

© ExxonMobil Canada Properties.

*What is cause and effect testing?

Most equipment onboard an offshore facility has instrumentation that measure pressure, temperature, smoke, gas and so on. Each instrument feeds back through Programmable Logic Controllers (PLCs) to Integrated Control and Safety System (ICSS) or Fire and Gas system logic. Once an instrument identifies an abnormal state it causes an effect, for example smoke is detected so dampers are closed, fans stopped etc. Cause and effect testing is a term used to test logic loops and in this case a surveyor's role is to verify that the HVAC system's logic is working properly.

Regulations continue to evolve, despite the pandemic.

Long before the COVID-19 pandemic updates to the regulatory regime were already planned for 2021. These changes will continue to be implemented, possibly with greater preparatory challenges due to the varied restrictions that have been experienced. In this article, we look at the new regulations that will take effect over the coming year.

Mark Towl
LR's Principal Specialist for Regulatory Risk, Development and Compliance

Future Safety Requirements

2020

MLC 2006: Piracy and armed robbery

2021

IMSBC Code 05-19:
- Materials emitting flammable or toxic gas with water
- Bauxite

ISM Code: Cyber risk management

Revision of the IBC Code Ch. 17, 18 and 21:
- Products reclassified as toxic
- New Certificate of Fitness required

2022

SOLAS IV: Float-free EPIRBs: Second Generation & AIS

IMDG 40-20:
- Lithium-ion batteries
- FRP tanks

2024

SOLAS II-1: Mooring arrangements

LSA Code:
- Twin engine lifeboats no longer require buoyant oars
- Hand-operated mechanisms for launching rescue boats

IGF Code:
- Lessons learned
- Fire protection
- Fuel containment
- Fuel tank loading limits
- Pressure relief on IC engines

IGC and IGF Codes: Materials for cryogenic service

While strictly speaking the 2018 amendments to the MLC and the Inventory of Hazardous Materials (IHM) requirements for existing ships under the EU's Ship Recycling Regulation (SRR) come into effect on 26 and 31 December 2020 respectively, they are close enough to 2021 to be worthy of inclusion here.

The new MLC requirements will mean that Seafarers Employment Agreements (SEA) will continue to have effect while a seafarer is held captive on or off the ship as a result of piracy or armed robbery against the ship, until such time that the seafarer is repatriated or until the situation resolves, and applies regardless of whether the SEA has expired, or if notice has been given to suspend or terminate it. Shipowners will need to amend their procedures accordingly to take account of the upcoming requirements.

The EU SRR will mean that all ships of 500 GT and over entering either European Economic Area (EEA – the EU plus Norway and Iceland) or United Kingdom (UK) ports and anchorages will be required to have a verified IHM onboard. EEA and UK flagged ships will require an Inventory Certificate issued by or on behalf of their flag state, ships which are registered in other countries will require a Statement of Compliance issued on behalf of their flag state.

Shipowners and operators should have already started this process in order to ensure compliance before 31 December deadline. However, for those who have not started we would advise you to start as soon as possible. To further support industry stakeholders with preparing for this change, we published a summary of the most frequently asked questions relating to EU SRR compliance.

What's new for 2021?

Cyber security

In 2017, the IMO Facilitation and Maritime Safety Committees approved MSC-FAL.1/Circ.3 which provides high-level recommendations for cyber risk management that can be incorporated into existing management processes. Cyber risk is perhaps something that hasn't been considered with the seriousness it deserves, despite several high-profile cyber-attacks the maritime sector has faced in recent years, including one on the IMO itself in September. With the publication of Resolution MSC.428(98), where required by the flag state, cyber risks are to be addressed in safety management systems from the first company Document of Compliance audit after 1 January 2021.

Amendments (05-19) to the IMSBC Code and Amendments (40-20) to the IMDG Code

There are regular amendments made to both the International Maritime Solid Bulk Cargoes (IMSBC) Code and the International Maritime Dangerous Goods Code (IMDG) to account for the latest information available and to consider cargoes that may not have previously been carried. Amendments to the IMSBC Code have been voluntary during 2020 but become mandatory from 1 January 2021. The amendments provide new individual cargo schedules with specific carriage requirements for the following Group B cargoes (cargoes that possess a chemical hazard which could give rise to a dangerous situation on a ship):

- Flue Dust, containing Lead and Zinc.
- Matte containing Copper and Lead.
- Metal Sulphide concentrates, self-heating UN 3190.
- Seed Cakes and Other Residues of Processed Oily Vegetables.
- Zinc Oxide-Enriched Flue Dust.

Shipowners may request that these cargoes are included in their certification.

The IMDG Code has been updated with Amendments (40-20) that will be available for voluntary use from 1 January 2021, becoming mandatory from 1 June 2022. Amendments include segregation requirements for alcoholates and a new special provision and handling code for medical waste.

New requirements for chemical tankers

There are several upcoming changes that will have an impact on chemical tankers including changes to the International Code for the Construction and Equipment of Ships Carrying Dangerous Chemicals in Bulk (IBC) Code carriage requirements for some chemicals, in particular, some products previously classified as non-toxic will now be considered toxic. It's important that ship managers and masters are aware of this as from 1 January 2021 some ships will require a new Certificate of Fitness, including a new List of Products, based on the revised requirements.

At the same time new MARPOL Annex II prewash requirements enter into force for cargoes of persistent floating substances with high viscosity. These include cargoes such as vegetable oils and paraffins when ships are in one of the designated special areas which are the North West European Waters, Baltic Sea, Western European Waters and Norwegian Sea. Ship Procedures and Arrangements Manuals will need to be amended prior to entry into force on 1 January 2021. The IBC Code and the Code for the Construction and Equipment of Ships Carrying Dangerous Chemicals in Bulk have also been updated to reflect the MARPOL amendments.

New sewage pollution prevention requirements for passenger ships

Due to the nature of the Baltic Sea, where the water volume exchange rate is very limited, Resolution MEPC.274 was adopted at MEPC 69 which took place in 2016. The requirements in Res. MEPC.274(69) will come into effect for passenger ships with a keel laying date before 1 January 2016 trading in the Baltic Sea special area from 1 June 2021, which requires holding tanks or a sewage treatment system meeting the new standards.

There is an allowance made for which passenger ships with a keel laying date prior to 1 January 2016 en route directly to or from a port located outside the special area to or from a port east of longitude 28° 10' E within the special area, are not required to comply until 1 June 2023, provided that they do not make any other port calls within the special area.

A new ECA for Baltic and North Seas

A new Emission Control Area (ECA) will come into effect in the North and Baltic Seas from 1 January 2021, which will be applicable to all ships constructed on or after 1 January 2021 to be fitted with Tier III engines. Future trading areas of the ship will need to be considered at the contracting stage to ensure that ships are able to trade as intended.

Beyond 2021?

The consideration and development of new requirements at an international level has been impacted by the pandemic. The IMO suspended its meetings for around six months whilst it changed the way it functioned to allow virtual meetings to take place. The meetings are shorter and the agendas have been compressed significantly.

This has meant that some regulatory developments have been prioritised, such as GHGs and carbon intensity reduction, others will continue to be developed but may take longer than anticipated to come into effect, for example, the new SOLAS Chapter XV on Industrial Personnel, and some new developments might have to wait a while longer until they are duly considered.

Future Environmental Requirements

2020

EU Ship Recycling Regulation: IHM

2021

MARPOL Annex I (Oil): Damage stability for existing tankers and gas carriers deadline

MARPOL Annex II: NLS cargo residues and tank washing

Amendments to MARPOL Annex II, Ch.16 IBC Code and Ch.V BCH Code: Pre-wash requirements in a new North Sea special area. P&A Manual updates

IBC Code:
- Toxic vapour testing
- High viscosity cargoes
- New Cerificate of Fitness

MARPOL Annex IV: Existing passenger ships sewage storage or treatment deadline

MARPOL Annex VI (NO_x): Tier III emissions control

2022

MARPOL Annex VI: EEDI Phase 3 (Tranche 1)

MARPOL Annex VI: Fuel sampling points

BWM Convention: Commissioning testing

2023

AFS Convention: Prohibition of Cybutryne

2024

BWM Convention: Final retrofit deadline

2025

MARPOL Annex VI: EEDI Phase 3 (Tranche 2)

TBC

Hong Kong Convention: awaiting ratification threshold for number of member states and proportion of world fleet represented

→ For further information about these or any other upcoming regulatory changes, please contact your local LR office or visit **www.lr.org/imo. Click here** to subscribe to receive our bulletin with updates of IMO agendas, reports and our forthcoming legislation document.

Navigating MEPC 75: Evidence of an Achilles Heel.

Regulating the GHG emissions from ships was never going to be easy and MEPC 75 demonstrated just how challenging the agenda really is, and more importantly, how challenging it will become. LR's Matthew Williams followed the debate and shares his views on the outcome.

Matthew Williams
LR's Principal Specialist for
Strategic Regulatory Projects

We all like polarised debates. They make deciding on our view easier because we can skip the detail. In measures to reduce the GHG emissions from ships, the poles are either high ambition or low ambition. Whilst the outcome of MEPC 75 can be viewed from either perspective, you would then miss an important point of detail: the outcome was predetermined by the availability of decision support information.

MEPC 75 demonstrated that information is the Achilles Heel of the regulatory response to growing GHG emissions from shipping. The Fourth IMO GHG Study provides important information on emissions, the IMO knows much less about solution readiness of alternative energy carriers and power sources, and about the impacts of policy options on the global fleet, economic growth, trade and sustainable development. This needs to be rectified.

Moving faster on increasing ambition for IMO 2030 and IMO 2050 and the measures to deliver an energy transition which some have called for will falter if it is assumed that there will be a different outcome with the same approach to information in the future.

No single entity can provide all the needed information but with it, IMO has a chance to be bolder in its decision making. LR's Maritime Decarbonisation Hub is our contribution to providing objective and evidence-based insight into what can be achieved and the ways and means to do it. We can all play our part; realising any degree of ambition depends upon it.

More work, less fuel

MEPC 75 agreed a short term-measure to reduce the carbon intensity of shipping, compromising a requirement for existing ships to be as technically efficient as new ships as soon as possible after October 2022 (the Energy Efficiency Existing Ship Index (EEXI)), and a requirement for operational carbon intensity reduction from 2023.

Whilst the environmental benefit of EEXI has been questioned, the time frame for compliance is unquestionably challenging and the industry is strongly recommended to take early steps to assess the impact of the EEXI on their ships, make the necessary adaptations and be prepared to demonstrate compliance from October 2022 (exact date TBC) at the latest. Not being compliant puts ships' ability to trade at risk.

Once you have passed the EEXI test, then comes the need to reduce operational carbon intensity from 1 January 2023. This requirement uses the building blocks already available in MARPOL Annex VI: the annual monitoring, reporting and verification cycle for fuel oil consumption data (IMO DCS) and the Ship Energy Efficiency Management Plan (SEEMP). Whilst the mandatory requirement to reduce carbon intensity has been approved and will be included in MARPOL Annex VI, the detail of: by how much, by when, using what metrics; the definition of a rating mechanism; and the verification audit regime for SEEMP will be in non-mandatory guidelines which are yet to be finalised and will be subject to a lot of work between now and May 2021.

The fact that so much of the detail remains to be determined makes planning for the measure challenging, but not impossible. It is this carbon intensity reduction requirement which will put increasing pressure on fleets between 2023 and 2030, with adaption bringing consequences for revenue, OPEX and CAPEX. Equally, the requirement will add a further level of sophistication to the business of shipping which can be leveraged. Understanding how limits on operational carbon intensity will impact trading patterns and voyage flexibility will be important, particularly for charterers and owners on the spot market.

Both requirements are subject to reviews which are to be completed by 1 January 2026 and will determine the extent to which the measure will tighten its grip on carbon intensity and under-performing ships thereafter. It is recommended that the planning assumption is that the performance of a ship under the more flexible regime pre-2026 will be taken into account should a more robust regime be implemented after 2026.

The measure remains subject to a detailed assessment of the impacts on States which needs to be competed for MEPC 76 in June 2021 but working on the expectation of a delay is not advised.

Funding for R&D

The industry proposal for an International Maritime R&D Board/Fund to accelerate the research and development of low-carbon and zero-carbon fuels, energy sources, propulsion systems and other new GHG reduction technologies was welcomed in principle but questioned on everything from trade impacts of the $2 per tonne of fuel levy to governance and intellectual property rights. We will have to wait until MEPC 76 in June 2021 to find out where a revised proposal could take the debate.

A fundamental question has arisen though: why does the funding and R&D need to be coordinated by or on behalf of the IMO? There are alternative ways of de-risking the investment, one of which is by reinforcing expectations that investment in an energy transition will be required in an ambitious timeframe. The value of bold, resilient decisions should not be underestimated. But that Achilles Heel needs treating.

The benefit for the industry is that this may serve the objective of getting scaled and commercialised solutions to market faster; the urgency of need focuses resources like nothing else.

Pace of change and market-based measures

Both the approval of the short-term measure and the discussion on R&D resulted in debates about the future level of ambition of the IMO and the need to bring forward work, particularly on market-based measures.

Going further and faster on emissions reduction makes the regulatory problem of a missing market for zero-carbon fuels acute. Designed correctly, market-based measures have an important role to play in addressing this market failure, but they proved divisive before and there is no evidence progress will be easier now.

Market-based measures change the rules of the game and the negotiations needed to achieve consensus. To date, consensus has been very comfortable with command and control and will continue to be if that Achilles Heel does not get treatment.

Other outcomes

Other relevant outcomes are summarised in LR's summary report of MEPC 75 available at **lr.org/imo**

Cyber security for superyacht sector now top priority.

An increase in cyber-attacks against superyachts during the pandemic, and new IMO requirements on the sector's cyber security systems from January, are pushing robust risk management up the agenda for owners and managers.

From 1 of January 2021, cyber security will come under the remit of the International Safety Management System (ISM) Code, supported by the IMO Resolution MSC.428(98), requiring shipowners and managers to assess cyber risk and implement relevant measures. Following new technology, more autonomy and greater connectivity, all contributing to greater cyber risk, experts at LR and Nettitude address the need for superyacht owners and managers to take a proactive approach during interactive webinar last month.

Even before the COVID-19 outbreak, the frequency of known attacks in the maritime sector had risen by more than 40% in just one year, according to an early 2020 survey by BIMCO and Safety at Sea. However, since the start of the pandemic, cyber-crime generally has increased by more than 400%, according to some estimates.

More opportunities for attack

In both information technology (IT) and operational technology (OT), the risk curve is rising as criminals see more opportunities for attack, Engel-Jan de Boer, LR Yacht Segment Manager, warned. This poses a growing threat to owners and managers, superyacht crews, guests and shoreside facilities including harbours and service providers.

de Boer conceded that privacy is a key feature in a sector that is made up of the rich and famous. But, he said, more information exchange – perhaps on a confidential platform – would be helpful both in tackling the incidence and severity of superyacht cyber-crime. The cost of inaction is high, he warned, with risks including espionage, reputation damage, invasion of privacy, vessel and personnel safety, hijacking, ransom and, in the very worst case, assassination.

From the beginning of 2021, commercial vessels of more than 500 gross tons will have to comply with new IMO requirements. A vessel's cyber security resilience will now become necessary as part of the ISM Code, requiring shipboard cyber arrangements to be included in vessels' safety management systems, with valid Documents of Compliance to be carried on board.

However, de Boer also pointed out that the IMO's new regulations are not the only ones of which those involved in the sector need to be aware. Other authorities, including the US Coast Guard, are also stepping up requirements.

Hackers don't check

And, de Boer said, just because the IMO's cut-off point is 500 gross tons should not let owners of smaller superyachts off the hook. A hacker doesn't check on the size of the vessel before he attacks; he is an opportunist looking for the best available chance.

Brendan O'Shannassy is a superyacht captain for Isle of Man-based Döhle Yachts. He compared the risk of cyber-attack to COVID-19. "We never thought about a biological virus until its arrival," he said. The risk of cyber-attack is very similar … it doesn't matter much until it happens to you.

Superyachts captains and their crews have plenty on their plates already, O'Shannassy said. What they want most is to feel confident that appropriate risk management systems are in place across vessel operations and communications, guest connectivity, use of devices, and entertainment.

"I'm speaking as an end user," O'Shannassy declared. "Twenty years ago, we were talking about physical attack. Now it's cyber-attack."

Proactive approach

From a practical point of view, Nettitude specialists Joe Donohue, Senior Information Security Expert, and Lukasz Michalski, Senior Security Expert, explained what owners and managers should do to prepare for the new requirements. An IMO Readiness Assessment is a good place to start, Donohue said, providing the basis for a cyber risk plan "in weeks".

LR has a series of guidelines in place, formalised in the LR Cyber Security ShipRight Procedures, for example. And Nettitude has developed a remote process, he revealed, enabling owners and managers to provide relevant information by questionnaire, at least for part of the process.

Responding to a question on outsourcing of the cyber security process, Michalski replied that this could save money but introduced another layer of risk. Third parties would have to be thoroughly vetted, he said, and their access to systems would have to be secure. And he added that some vessel service providers preferred to have 'always-on' connectivity arrangements; however, this was not always necessary and should be assessed.

One webinar participant asked for the experts' views on compliance versus risk-based systems. Donohue summed up by saying that compliance usually means being able to handle risks that were already evident, and sometimes at only a level sufficient to meet regulations. A risk-based strategy, on the other hand, would provide a more proactive approach, exceeding minimum requirement as he believes is now necessary, with a rapidly diversifying range of risks to cover.

Finally, a wake-up call for those hoping to sail under the radar, particularly owners and operators of vessels under 500 gt, exempt from the January regulations. They should examine their vessel insurance policies closely.

New cyber risk clauses introduced by underwriters, require that cyber security systems must be in place and seen to be operating effectively. Owners and managers can no longer merely pay lip service … if there is no effective system in place, then insurance policies are invalidated.

LR has a 42% share of the 5,570 superyacht market and is classing close to half of the vessels on order, as measured in gross tonnage.

Protect your superyacht, guests and crew from cyber-crime.

Watch LR and Nettitude's cyber security **webinar on demand**

Proactive vs. reactive cyber security strategies in maritime.

2020 has put maritime organisations in the firing line for cyber-attacks, and they can no longer afford to bury their head in the sand. Nettitude's Vice President of Cyber discusses what actions needs to be taken to stay ahead of this rising tide.

Tim Percival
Vice President of Cyber, Nettitude

In September 2020, CMA CGM, the world's fourth-largest container shipping company, announced that it had experienced a cyber breach. Initially stating that its systems security hadn't been compromised, a few days later, it had to declare that it was working on a plan to get access back to its systems. A few years ago, this kind of news would have been unheard of, however organisations publicly declaring that they have suffered a cyber breach is becoming almost an everyday occurrence.

Due to the openness and interconnected nature of the Internet, hackers or hacking groups are carrying out untargeted attacks, without any consideration for damage inflicted upon maritime organisations. These attacks can be delivered as phishing attacks, water holing, ransomware, or scanning and are relatively easy for hackers to administer. What's more, their chances of being apprehended are almost non-existent, meaning the fight against cyber-crime is one of a continuous nature.

One of the key areas of cyber-vulnerability in the shipping industry is the ships themselves. Until recently, ships were running legacy systems with relatively small IT networks and a segregated OT (operational technology) network. The ships OT network is closed off from the outside world with limited access to it, usually only physically accessible by the Captain and senior crew. Due to digitalisation in the industry and the convergence of IT and OT, there is now a focus on extracting key data from OT systems, sending it to the cloud, so that data analytics can be carried out in real-time. Such digital developments have created an additional level of risk for shipping companies to consider and have transformed vessels into remote offices more than ever before.

Over the last three years, there has been a staggering 900% increase in cyber-attacks on the operational technology of maritime organisations, in which some of the largest shipping companies in the world have been the victim. We've seen a number of reported cyber-incidents this year alone. Carnival Cruise Line, Mediterranean Shipping Company (MSC), and the Toll Group have all been in the limelight for cyber-attacks, inflicting not only operational and economic damage, but also a significant knock to their reputation. While many of these organisations are targeted, it can also simply be a case of being in the wrong place at the wrong time.

Can maritime organisations do anything about randomised cyber-attacks?

The immediate answer is 'yes'. There are ways to prevent businesses from being breached, particularly as most breaches that occur aren't designed to target a specific customer.

One solution is to 'do nothing'; an approach that too many companies take. Preferring to believe 'It won't happen to them', questioning 'Why would we be targeted?', and doubting the companies draw 'We don't have anything of interest to a hacker'. These are just some of the comments that companies make without really understanding the reality of how the Internet works and how easy it is to target companies. The other factor to consider is the modus operandi of hackers. Stealing corporate data, encrypting systems or generating bitcoin are just some of the motivators. What if the motivation is 'to cause damage for fun' or to take systems down for 'bragging reasons' on dark web hacking forum sites? Do we really want to take the chance that hackers can do what they want without understanding why they might do it?

So, if we don't always know why hackers do what they do and the agreed approach that doing nothing isn't an option, then a great starting point is to carry out some form of risk assessment, using a globally recognised framework such as NIST, ISO 27001, or BIMCO.

By understanding business risk, a company can put a plan in place that focuses on people, process, and technology. By understanding how users behave, the defensive layers that are in place, this will help an organisation to know how a hacker might compromise them and help to determine what additional layers of security are required to minimise a breach in the first place. This might include security awareness training or penetration testing on key systems, to identify any known vulnerabilities that a hacker could compromise using targeted or untargeted techniques.

Fortunately, companies don't need to do this alone. Recently, the IMO has released requirements on a cyber security resolution which come into effect on 1st January 2021 and encompasses any organisation that owns and/or operates ships. This is something that all shipping companies need to take seriously and could be a great starting point for businesses that don't understand the basics or have a plan in place to protect themselves. It will be enforced through flag states via class societies and through ISM audits. IMO 2021 isn't a silver bullet solution that will solve all cyber issues; however, it will provide maritime organisations with a much clearer understanding of risk and how to manage it. If shipowners and operators can quantify the risk, then a plan can be put in place to mitigate it.

The reality is that all of the breaches that have taken place in maritime recently have all compromised the head office infrastructure, as opposed to the ships themselves. Most vessels have a relatively small external IP infrastructure, likely to be one IP address and if the OT network is truly segregated from IT then the risk to those vessels is small. It doesn't mean that an organisation shouldn't think about the risks to vessels, however, if most of the data, booking systems, IT infrastructure, and people with access to key systems are in the office, then that is the area that is most likely to be affected by a cyber breach.

So, is doing nothing an option when it comes to cyber security?

The answer is no. Having a cyber strategy is fundamental to protecting customer data, minimising operational downtime, and reducing the negative impact on share price. No guarantee exists when it comes to avoiding a cyber breach altogether, however, by adopting a cyber strategy will help prevent a breach. Whereas, the risk of doing nothing could cost millions of dollars, meaning now is the time to do something about it.

Assurance beyond Class.

Crack management of naval vessels.

Crack inspections and repairs on naval vessels are hampered by insulation, equipment, piping, and cabling. Unlike tankers and bulk carriers, naval vessels have widely varying structural arrangements, survivability requirements, and mission profiles. As a result, dealing with cracks can be challenging and expensive.

To help naval clients tackle this problem, LR ATG developed a damage-tolerant approach to managing cracks through the development of Crack Management (CM) procedures for an operational naval vessel.

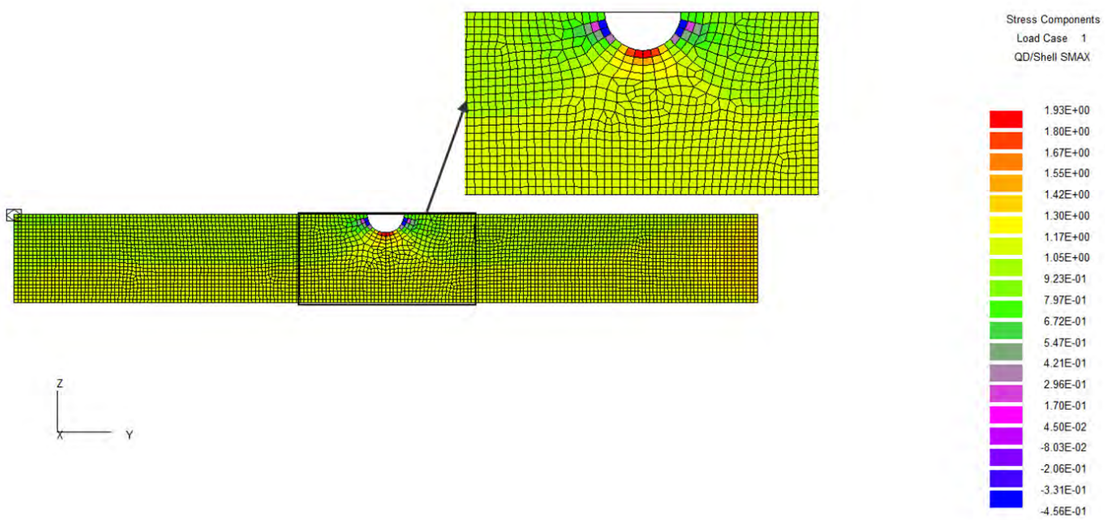
CM, in the context of this guidance, implies the combination of procedures, methodologies, and engineering analyses carried out to effectively enable the efficient management of cracks. Naval clients can use CM plans to improve and enhance maintenance practices that maximise a vessel's availability throughout its operating life.

The impracticality and cost of adopting a full-scale repair scheme in all instances of cracking along with operational demands, has led to the desire to develop CM procedures that will accept that some degree of fatigue damage will occur over the life of the vessel, and will offer a practical damage-tolerant approach to managing these cracks.

LR ATG assisted in identifying areas of the hull that are historically more susceptible to cracking which provides the opportunity to incorporate those locations into the inspection plan. The overall risk associated with a specific crack is established based on a combination of the probability of cracking as well as the consequence of cracking.

The client now has a formal CM plan that when implemented will provide a systematic and consistent approach to managing cracks during the operational life of a vessel.

Risk	Corrective Action
Low	• May choose to monitor • Repair immediately if practical, if not, • Determine timeline to increased criticality/monitor
Medium	• Repair immediately if practical • Perform simplified crack growth/criticality calculations • Determine time to increased criticality
High	• Repair immediately if practical • Perform detailed crack growth/criticality calculations • Determine time to increased criticality



JUNIOR M ruling offers clarity on class surveyor obligations.

LR Group Head of Dispute Resolution and Compliance Andrew Kennedy explains why the findings of the French Supreme Court are welcome news to classification society surveyors.

The contention that neither LR nor its surveyors should be liable for conducting surveys not required under the terms of the published LR classification Rules and Regulations has been upheld in French Supreme Court, overturning a prior ruling of the Rennes Appeal Court in 2017.

The Rennes court had ordered LR liable, along with the shipowner, to Axa the cargo insurer, for damages of €304K to a cargo of ammonia nitrate on board an LR classed general cargo vessel *JUNIOR M*.

In 1999, at the time the damage was suffered, *JUNIOR M* was a 27 year old general cargo ship travelling from St. Petersburg to Jorf Lasfar, Morocco. As the vessel proceeded down the English Channel in heavy weather, the Master reported water ingress in No 1 cargo hold and sought refuge in Brest. When *JUNIOR M* was granted refuge in Brest in October 1999, French naval divers found two holes in the hull (partially plugged with wood and cloth) and the Brest Court expert himself found wastage which had holed a bilge well and sounding pipe in No 1 cargo hold.

The cargo was off-loaded and disposed of safely (some was sold), and the vessel was abandoned by the shipowner. Evidence in the case, from the record of the draught survey carried out on cargo interests/ owner's behalf just prior to departure, after the vessel had been fully loaded, also revealed when *JUNIOR M* left St Petersburg it had less freeboard than required by the LR issued load line certificate and the load line marks on the side of the vessel.

Axa paid the balance of cargo interests' claims and sought indemnity from the shipowner and LR. The Rennes judgment found the shipowner and LR jointly liable. The Rennes court stated LR's liability was on the basis of the Court Expert's report of the defects found in the vessel in October 1999, and his view that LR should have done further surveys of the ballast tanks in 1999.

JUNIOR M

LR appealed against this judgment to the Supreme Court. LR contended that, neither LR nor its surveyors, should have a legal liability to conduct surveys that are not required in the terms of the published LR classification Rules and Regulations. LR pointed to the detailed records from the last 1998 LR special survey visits showing that all the ballast tanks had been surveyed in accordance with the regulations, and the condition of the coating in the ballast tanks reported as poor by LR, but no holes of the type observed in October 1999 were reported in 1998.

The French Supreme Court, accepting LR's appeal, has now ruled there was no evidence presented to the Rennes court of LR surveyors breaching relevant LR survey requirements in the class Rules and Regulations, prior to the damage occurring in 1999. Therefore, the Supreme Court has quashed the Rennes judgment against LR, rendering it null and void.

This case emphasises that LR surveyors must be judged against the obligations for survey in the published Classification Rules and Regulations and the terms of the applicable international conventions. It echoes the findings of courts in common law jurisdictions, and some other civil law jurisdictions.

Since 1999 requirements for ballast tanks have been updated to help mitigate the risks arising from this type of damage. With the coming into force of the IMO Performance Standard for Protective Coatings (PSPC) as specified by SOLAS Ch. II-1/3-2 in 2008, there has been a marked improvement generally in ballast tank coatings. Ballast tank coatings now have to be applied under strict conditions at new building and maintained in good condition.

What's happening in our world.

The world doesn't stand still and neither do we. Catch up on the latest developments at LR from our teams around the globe.

LR, Anemoi and SDARI join forces on rotor sail designs.

LR has signed a joint development project (JDP) with Anemoi Marine Technologies (Anemoi) and Shanghai Merchant Ship Design and Research Institute (SDARI) to develop a series of energy efficient vessel designs equipped with rotor sails.

The project will address one of the most significant roadblocks for the commercial adoption of emission abatement technology – the collaboration between original equipment manufacturer, designer, regulator and shipowner to agree a pathway for the commercial success of installed technology onboard vessels. Along with the installation of rotor sails, the vessels could also incorporate

new hull forms, new energy management systems, a new powering arrangement and modified operational requirements.

By opening the JDP to shipowners, the parties can ensure that the technology fits the market needs and can provide better decision support for the installation of this technology across the range of common ship types demanded by the wet and dry bulk markets.

Mark Darley, LR Marine & Offshore Chief Operating Officer, said: "As the need to decarbonise the shipping industry becomes more imminent, this JDP marks an important milestone in the journey that the industry is taking and further demonstrates LR's commitment to accelerating this transition. Through this JDP we look forward to working with the key stakeholders to develop designs that will meet current and future environmental targets."

LR selected for Australia's Hunter Class Frigate Program.

LR has been appointed as the class society for Australia's Hunter Class Frigate Program, the largest surface ship project in the nation's defence history.

BAE Systems Australia's shipbuilding business, ASC Shipbuilding, will deliver the nine anti-submarine warfare frigates, known as the Hunter class, to the Royal Australian Navy. ASC Shipbuilding awarded LR the contract to provide tailored Naval Classification and Certification Services for the Hunter program's prototyping phase, which is on track to cut steel this month.

Naval Classification and Certification Services will be delivered by the LR Australia team, who will be co-located with ASC Shipbuilding employees at the state-of-the-art shipyard at Osborne, in South Australia.

David Lloyd, LR's Global Naval Business Director said: "We are delighted ASC Shipbuilding selected LR to provide Naval Classification and Certification services to the Hunter Class Frigate Program, an important component of Australia's continuous naval shipbuilding strategy. LR's support to ASC Shipbuilding in achieving Class accreditation for the Hunter program demonstrates our commitment to providing tailored, world-class assurance services to our defence industry partners and navies as well as unparalleled experience in supporting new naval construction and sustainment programs around the world."

LR to acquire C-MAP Commercial from Navico Group.

LR has reached an agreement to acquire Navico Group's C-MAP commercial marine business, a leading provider of commercial marine cartography and digital publications, shore-side and shipside voyage optimisation, cloud-based fleet management and fleet analytics software. The acquisition will be integrated with the i4 Insight platform, strengthening the existing performance platform ecosystem.

The acquisition builds on LR's vision of solving problems with integrated digital solutions with the aim of conquering the challenge of isolated and disconnected maritime systems. It follows recent partnership agreements between i4 Insight and other maritime players including GreenSteam and LAROS™ (see below).

"This important development is further evidence of how LR is rapidly building up our maritime digital solutions. In particular, this acquisition enables us to strengthen how we help our clients, and the maritime industry more broadly, accelerate operational efficiency improvements. Importantly, the capabilities we have acquired are highly relevant to the industry's goal of simultaneously reducing costs and emissions. This forms part of our wider strategy where we are combining inhouse, proprietary software development with alliance partnerships, corporate venturing and acquisitions – to build more cohesive and integrated digital solutions specifically tailored to maritime market needs," said Nial McCollam, LR's Chief Technology Officer.

"We now have an opportunity to further enhance our i4 Insight platform with a powerful set of navigation products and optimisation tools. By adding these products and services to our existing capabilities we continue extending our digital strategy focused on ensuring customers have the right information at the right time to solve key operational challenges," said Joel Meltzner, Chief Executive Officer of i4 Insight.

i4 Insight integrates GreenSteam's solution onto its platform.

i4 Insight has partnered with GreenSteam, a leader in vessel-based machine learning for hull and improved vessel performance. This partnership looks to provide solutions that will help drive reductions in GHG emissions and cut operating costs.

The i4 Insight Platform allows shipowners, operators and charterers to easily access insights on performance and fuel consumption across all ships in their fleet. The addition of GreenSteam's advanced machine learning technology means that platform users will have a more accurate picture of the leading contributors to excessive fuel consumption as well as access to actionable recommendations on how to optimise fleet performance.

GreenSteam was one of the first companies to apply machine learning to vessel performance data and its system can analyse data from thousands of vessels, continually learning, adapting and updating what it knows about each vessel.

i4 Insight integrates LAROS™ sensor data for operation analysis.

Announced in November, i4 Insight has gone into partnership with Prisma Electronics to integrate its LAROS™ sensor hardware data onto the platform. The addition of this data to the i4 Insight platform is another step towards helping charterers, owners and operators achieve greater operational efficiency and reduced operational expenditure.

The LAROS™ solution has wireless high-frequency sensors and collectors, known as Quax units, collecting real-time vessel performance data. i4 Insight then ingests, monitors and aggregates the data with other data sources, providing customers with the ability to improve decision-making and operational performance.

"We are very pleased with our cooperation with i4 Insight as this will provide the maritime companies with reliable decision-making tools to improve their operational excellence. i4 Insight is the ideal platform that fully utilises LAROS™ structured data in an unprecedented manner offering unparalleled value to its users," said Christos Giordamlis, Prisma Electronics Chief Executive Officer.

Expert Voice

LR's Expert Voice podcast series – driving the debate in marine and offshore. Each of our podcasts features leaders and influencers from across our industry, in frank conversation with one another, focusing on trending topics and challenging discussion points.

Listen to the latest podcast: **info.lr.org/podcast/expert-voice**

Changing faces.

Mantel takes LR commercial mantle in North Europe.

LR has appointed Peter Mantel as Commercial Manager for North Europe, starting from 1 December 2020. Working out of Rotterdam, Mantel will be responsible for maintaining client relationships, driving sales performance, and leading marketing activities within North Europe.

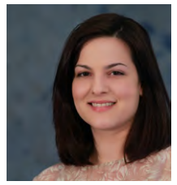
Mantel brings a wealth of digital expertise within the maritime sector holding positions such as Managing Director, Sales & Marketing Director, Executive Board Member and Shareholder at Transas Marine (now part of Wärtsilä).

Commenting on the new appointment, Markus Buesig, LR's President M&O North Europe, said: "Peter is highly skilled in digital solutions, specifically in maritime, so I am convinced his appointment will offer a fresh outlook when it comes to embracing technology, helping customers capitalise on opportunities for sailing fleets and new building projects."

Peter Mantel, LR's new Commercial Manager for North Europe, said "The marine and offshore landscape is changing as we move towards the digital revolution. Transforming existing solutions, systems and processes through innovative technology has been central to my maritime career, and I am excited to join Lloyd's Register and continue this work with a world-renowned team of industry experts to support clients explore new opportunities and embrace this monumental change."

LR strengthens its marine and offshore team in Greece.

LR has boosted its customer account management focus in Greece, Cyprus and Israel with a number of significant appointments to support the needs of its marine and offshore clients.



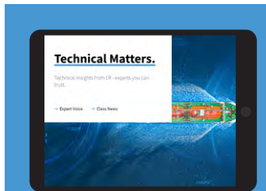
← Left to right: Nikos Tsatsaros, Katerina Kontogianni and Theodore Kourmpelis

Nikos Tsatsaros takes on the role of Commercial Manager for Greece, Cyprus and Israel, leading an already strong local team. The team has been further enhanced with the additions of Katerina Kontogianni and Theodore Kourmpelis.

With a 14-year career in LR, Tsatsaros brings a wealth of technical and commercial experience in the marine industry. Starting out as a seagoing engineer before joining LR as a surveyor in Liverpool, UK, he has spent much of his career in China, undertaking the role of surveyor in charge in Zhoushan-Ningbo. His involvement with new construction projects has enabled him to undertake strong commercial responsibilities for non-Chinese clients with newbuilding interests in Greater China.

Kontogianni has more than a decade of experience shared between classification and ship operation. Having worked closely with top management of tanker operators, and with a strong background in safety, environmental, energy systems management and regulatory compliance, Kontogianni can readily support LR's Greek clients.

Kourmpelis brings hands on technical experience to the Greek commercial team, having worked as an Electro-Technical Surveyor in the Greek Technical Support Office since joining LR. He has dealt with complex multidiscipline projects and type approvals for electrical and control components and has been involved with numerous alternative fuels projects.



Technical Matters

LR's Technical Matters series brings you regular opinion and insight from technical experts on a wide range of topics, from enhancing safety to improving asset performance. In each issue, we will consider how new regulations, technologies and innovations can be pragmatically and safely applied, weighing up the pros and cons in each case, and focusing on practical, efficient application.

Read the latest Technical Matters: **info.lr.org/expert/technical-matters**

Supporting our clients.

Partnership aims to develop hydrogen ferry.

A group of companies have partnered up to develop a 100% hydrogen-powered ferry for DFDS' Oslo – Frederikshavn – Copenhagen route. The ferry will be powered by electricity from a hydrogen fuel cell system that emits only water and can produce up to 23 MW to propel the ferry.

"The largest fuel cell systems today produce only 1-5 MW, and the development of such large-scale fuel cell installations for an electric ferry is a monumental task. We can only succeed in partnerships with companies that together can muster some of the globe's finest expertise in design, approval, building, financing and operation of innovative vessels," said Torben Carlsen, CEO of DFDS.

The partnership committed to achieving this includes DFDS, ABB, Ballard Power Systems Europe, Hexagon Purus, LR, KNUD E. HANSEN, Ørsted and Danish Ship Finance.

"Together, we expect to learn how to make these fuel types and technologies commercially viable, which is key to a transition of the industry to climate neutrality, which is also the ultimate goal of DFDS' climate plan," added Torben.

The ferry, with the working name Europa Seaways, is designed for 1,800 passengers and has capacity for 120 lorries or 380 cars. If the project develops as projected, the ferry could be in operation on the route as early as 2027. The hydrogen will be produced locally in Greater Copenhagen based on offshore wind, and the project will investigate how to optimally integrate with the local energy system. The partnership has applied for support from the EU Innovation Fund.

SAGA awarded new COVID safety accreditation.

SAGA has moved a step closer to sailing with award of new COVID safety accreditation by becoming the first cruise operator to be awarded new COVID-19 health assurance accreditation by LR. The move is a crucial step ahead of the planned return of cruise operations in spring next year in a COVID-secure environment.

LR has awarded SAGA the Shield+ accreditation, the highest category of health assurance. The new framework has been created to reduce risk and provide greater confidence in the safety procedures of operators against the introduction of infectious diseases onboard cruise ships, including COVID-19, Norovirus and common flu.

Being awarded the accreditation demonstrates that SAGA exceeds the compliance criteria in every category set out by the UK Chamber of Shipping in their guidance for COVID Secure Cruising. The safety accreditation is assessed against six key categories covering every aspect of ship safety where health risks are elevated: medical, policy, food, ventilation, accommodation and water.

SAGA's ships have been surveyed and inspected in all key areas and the accreditation has been awarded for both the *Spirit of Discovery* and SAGA's brand new ship, the *Spirit of Adventure*, which is due to set sail for the first time in May 2021.

Joep Bollerman, LR's Global Passenger Ship Manager, said: "We are delighted to award our first ever Shield+ certification to SAGA. Our new standards are based on medical science from the global health industry, including guidance from the World Health Organization and the Centers for Disease Control and Prevention (CDC), in line with the Cruise Lines International Association (CLIA). Shield+ provides a detailed survey and inspection regime of the key areas where health risks are elevated, which helps operators like SAGA maintain the highest health standards at sea."

Lloyd's Register

Get in touch

Please visit www.lr.org for more information

Lloyd's Register Group
71 Fenchurch Street
London
EC3M 4BS
UK