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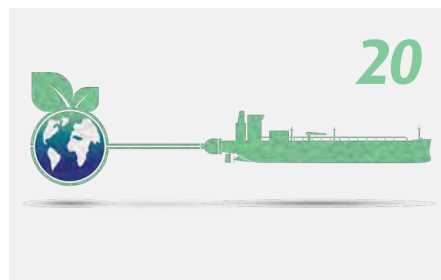
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Chairman's Message



Reflecting back on 2019, one cannot but think of the wave of protests sweeping Hong Kong, Chile and numerous other countries, and what that portends. But the largest momentum shift may have been on the topic of climate change – what a sea change we have seen in the space of a year.

Environmental awareness is of course not new. The Rio Earth Summit in 1992 established the UN Framework Convention on Climate Change (UNFCCC), the Kyoto Protocol was signed in 1997, and the Paris Agreement was signed in 2015, not to mention numerous other COP (Conference of Parties) meetings along the way.

What has changed is the intensity of discourse and the level of urgency. From the protests of Extinction Rebellion to the advocacy of Greta Thunberg, public consciousness is rising. In the words of UN Secretary General António Guterres: “Climate change is the defining issue of our time”. As the UN Intergovernmental Panel on Climate Change (IPCC) put it: “There is alarming evidence that important tipping points, leading to irreversible changes in major ecosystems and the planetary climate system, may already have been reached or passed.” European Commission President von der Leyen recently presented her plan to make the EU the world’s first “climate-neutral” continent by 2050.

Amidst all the justified concern on the topic, we must also acknowledge the realities. In November 2019, the US began the formal process of withdrawing from the Paris Agreement. COP25 in Madrid in December 2019 failed to achieve any meaningful progress. While parts of the world (especially Northern Europe) worry about the environmental effects of greenhouse gases, many people around the world have more basic needs to worry about such as food, shelter and security. Energy is a critical enabler to lift people out of poverty. Construction contributed some 11% of global carbon emissions (shipping is estimated at 2%); according to the International Energy Agency, almost 8 billion tons of CO₂ in 2017 came from buildings, steel and cement compared to 2.6 billion tons from oil and gas. We have to balance the needs of human beings today - affordable shelter, food, heating, mobility - with concerns about our environment tomorrow.

In the pages of this magazine you will find stories about the transport of carbon-based energy alongside stories about cleaner fuels, batteries, and technologies to help alleviate our footprint. This reflects our dual mission “to provide energy for the world today, and find solutions for tomorrow”. Urgency to create a better world must be matched with pragmatism; those who argue for only

one extreme may be risking the welfare either of their peers or of their children.

Finally, we advocate a carbon levy for shipping that puts a price on the environmental cost of fossil fuels. There is the same tension in this – that increases in the price of energy may result in a burden on some who can ill-afford the additional cost – but the burden can be spread over time to achieve the right balance between current and future needs. As the UN Secretary General framed it: “To put a price on carbon is vital if we are to have any chance of limiting global temperature rise and avoiding runaway climate change.”

As we approach a new decade, we should remain hopeful that diverse opinions combined with human ingenuity will lead us to solve the defining issues of our time. I am grateful to our seafarers, shore staff, directors and team members around the world for enabling BW to play its part in this. I wish all of you, and our customers and stakeholders, a successful year ahead.

Sincerely,
Andreas Sohlen-Pao
Chairman

Ringling the Bell

Hafnia successfully lists as one of the largest shipping companies on the Oslo Stock Exchange

Years of strengthening the business and preparing for the capital markets culminated in the successful listing of Hafnia on 8 November. This is the beginning of an exciting new chapter in the company's history, and provides a new platform for growth following the recent merger of Hafnia and BW Tankers.

Merger and Reorganization

In November 2015, BW Group's product tanker arm, then named BW Pacific and managed by CEO Tina Revsbech, decided against a listing on the Oslo Stock Exchange due to challenging market conditions. Instead, the team dedicated its focus to



(Above) All smiles after Hafnia's listing on the Oslo Stock Exchange. From L-R: Thomas Andersen (EVP, Investor Relations); Erik Bartnes (Board Member); Mikael Skov (CEO); Perry van Echtelt (CFO)



(Above) Mikael Skov rings the bell at the Oslo Stock Exchange

navigating the fleet and business efficiently through a difficult market cycle. Two and a half years later in July 2018, BW Group was presented with an opportunity to purchase shares in Hafnia Tankers, a company with similar values and ambitions. BW Group purchased 43.5% of Hafnia from Blackstone. Both companies operated side-by-side for about six months until they were successfully merged in January 2019 to form Hafnia, with Mikael Skov taking the reins as CEO of the unified entity.

Private Placement before Listing

The Oslo Stock Exchange offers an efficient route to the public markets, and it has a long-standing history of shipping-related IPOs and listings which international investors are familiar with. BW Group had previously used the exchange to list a number of its companies, so it viewed this as a natural step for developing Hafnia into a leading product tanker company and to provide liquidity for some of its longstanding private equity shareholders.



(Above) Singapore and Copenhagen offices celebrating with their own simultaneous bell ringing ceremonies using an old ship's bell

On 5 November 2019, Hafnia announced the successful completion of a pre-listing private placement of USD 230 million which was deemed to be a favourable fast-track path to a direct listing. The transaction garnered significant interest from high-quality investors worldwide. On 8 November 2019, Hafnia was listed on Oslo Axess with a share price of NOK 25.45. Pareto Securities and Skandinaviska Enskilda Banken (Oslo Branch) acted as joint global coordinators in both the pre-listing private placement and the Oslo Axess listing.

CEO Mikael Skov says, “this all started with a vision of creating a great workplace that puts people first as we build the best product tanker company in the world together. It has been quite the adventure, especially in the past eleven months since the successful completion of the merger of Hafnia Tankers and BW Tankers, and I thank all our colleagues for working hard on the listing process, while ensuring our ships continued to sail smoothly and our business continued to put customers first. Our Culture and Values will guide our next stage of growth, towards realizing our Vision of being Best on Water.”

Adds Perry van Echtelt, “We have successfully raised USD 230m in the market, and Hafnia with an NAV of around USD 1 billion, is one of the largest shipping companies listed on the Oslo Stock Exchange. This was also the largest shipping listing in the

Norwegian capital markets since 2013. We have communicated our compelling story to investors and we are well positioned to capture the upside of the market going into 2020. We look forward to this journey and are eager to start working as a listed company that creates value for our shareholders.”

Leading the Competition

Hafnia is one of the world’s leading oil product tanker owners and operators, operating a fleet of over 180 vessels in pools including newbuilds. With an average age of approximately 6.4 years, most are of modern eco-design which incorporates the latest technological improvements designed to optimize speed, fuel consumption and reduce emissions. A young and well-maintained fleet reduces operating costs, improves safety, vessel utilization and quality of service delivered to customers. This a competitive advantage for securing favorable charters with high-quality counterparties.

Hafnia’s experienced management team have demonstrated their ability to manage the commercial, technical and financial aspects of Hafnia’s business. Hafnia also intends to leverage the advantages afforded by being “a member of the BW Group” to maximize scale benefits. **wh**



All oars in the water

World Horizon speaks with Michael Rasmussen, General Manager of Hafnia Pools, on fleet reorganization efforts at Hafnia



Since the successful combination of BW Tankers and Hafnia Tankers in January 2019, employees have steadily worked on leveraging the company’s increased size and scope to generate even greater value to customers. In addition to the company’s listing on the Oslo Stock Exchange on 8 November, one of the most pertinent changes has been the integration of BW Tankers’ legacy fleet into a pool structure. In May 2019, Hafnia bought out the minority shareholders of its associated

companies, Hafnia Management A/S and subsidiaries, which used to operate and manage the MR Pool and SR Pool. Hafnia also acquired all shareholdings in K/S Straits Tankers and Straits Tankers Pte Ltd, which used to operate and manage the LR1 Pool. The pools have been rebranded and named Hafnia LR Pool, Hafnia MR Pool and Hafnia Handy Pool. BW speaks with Michael Rasmussen to understand more about Hafnia’s pools and their value propositions.

World Horizon [WH]: Tell us a little about how Hafnia pools operate.

Michael Rasmussen [MR]: The pool concept is an interesting paradox – it has a mixture of “capitalistic” leanings combined with a “communist” arrangement. We have pool managers and their teams, commercially managing the vessels, and trading these vessels in a mixture of time charters, spot voyages and contracts of affreightment (COA). Proceeds go into a pot for sharing amongst pool participants. We can have some ships earning US\$50,000 per day, and some ships earning US\$5,000 per day, but we split the earnings equitably. Next month, fortunes may reverse but the earnings continue to be shared equitably. This is the advantage of being part of a strong and performing pool. To share profits equitably, we use the concept of pool points. Pool points are allocated to each pool partner vessel based on two key performance factors - vessel bunker consumption and speed. If your vessels are modern vessels that include fuel efficiency improvements in their design and operations, you will be allocated more pool points. Generally, pool points are determined after analyzing noon reports that vessels submit daily; we note the speed and consumption of each vessel against projections, which we then measure against a pool index to determine a spread in pool point allocation. This approach, where pool points are allocated based on vessel performance statistics, ensures fairness and transparency in the management of Hafnia’s pools.

WH: What would you say are Hafnia’s main strengths as a pool operator?

MR: Two things – size and experience. Firstly, size. By operating over 180 vessels in the pools, Hafnia benefits from significant commercial, financial, technical and operational synergies. As one team, we have deep exposure to, and understanding of, market information through broad experience across commercial shipping, finance and law. We have a mix of time charters which provide fixed income, and spot contracts which are more volatile but can lead to higher income. As a large pool, charterers are guaranteed that there is a ship available to meet their requirements. Sometimes we take better paying voyages, and sometimes we have to accept voyages which are less so. An experienced team can take advantage of market opportunities to ensure we have more of the former. As a shipowner this means your vessels become more relevant to the customer and benefit from constant transactions and steady cash flow.

Secondly, experience. We have a modern fleet, strong commercial understanding and knowledgeable technical team. We take a long-term approach with our customers, which

also results in a more sustainable approach to business. We are shipowners too, not just managers, so we understand where pool members are coming from. Our main goal is to optimize the vessels’ employment while keeping expenses low.

As an international team, we can cover all time zones and we are ready to serve our customers quickly and flexibly. The expanded fleet has allowed Hafnia to utilize the data generated to further optimize vessel operation and planning. We share knowledge through half-yearly Technical and Operational Committee Meetings (TAOC) which are held in Copenhagen and Singapore. We discuss any concerns we have in a candid and honest fashion, and make sure we address issues faced by pool partners. We then conclude with a party and recharge ourselves for the next six months before we see each other again.

WH: What would you say is the most essential skill for managing a pool well?

MR: I would say transparency and diplomacy are the most important skills. To achieve win-win situations, it is critical that you treat your colleagues and pool partners respectfully, while also engaging in frank and open dialogue. There are many reasons ships may not perform up to technical expectations. To understand why requires close communications. I have been in the business for over 30 years, and no day is alike. What is constant, is that we must treat people with respect, and we must take care of our pool partners. We have built a reputation as a friendly, fair and accommodating pool operator and we intend to keep it this way.

WH: Any parting thoughts to share?

MR: We have a strong brand, and we make sure we build on the trust given to us by our pool partners. We are very proud that despite all the recent changes in Hafnia, we have not lost a single pool partner. In 2020, we look forward to harnessing the opportunities from mandatory regulatory changes to further drive the business. We will take advantage of our size to secure attractive bunker arrangements. We are all ready for IMO2020, and we are ready to ensure all our vessels have access to IMO2020-compliant fuels.

Finally, it has been a hectic and exciting journey. People outside look in and see our success story, but achieving that has involved a lot of hard work. We have done well because of a combination of skill and lots of luck. We remain humble and thank our customers and pool partners for their trust and their business. We look forward to many more years of sailing together. **wh**

Digital Lighthouse

Taking small, cumulative steps to harness technology and bridge the onshore/offshore divide



Imagine yourself onboard a vessel out at sea, about to commence a site inspection. However, in place of full personal protective equipment and travelling thousands of miles from home, you are performing the inspection from the comfort of your desk as part of a typical day in the office.

Your imagination is not needed for much longer. This is not a distant vision that can only be reached with large investments into new infrastructure and equipment. Groundbreaking technology need not be expensive, large-scale and difficult to implement. Sometimes, currently available technology, used in an innovative way, is all that is needed. A nimble team can build on available IT infrastructure, integrate new solutions with existing systems and tools to achieve many quick wins and build competence in the short term.

By harnessing available technology in innovative ways, BW Offshore has already achieved quick wins in tapping into the burgeoning fields of Artificial Intelligence, Internet of Things and Machine Learning. This approach is part of BW Offshore’s Digitalization Strategy, which defines a framework around which initiatives should be introduced and implemented in a structured and collaborative manner.

A Matter of Chickens and Eggs

While there cannot be an easy answer to the question of whether the egg or chicken came first, it is easier with technology. The ability to securely and efficiently store, analyze, and distribute past and current business data is fundamental to implementing AI and digital solutions. For years, teams at BW Offshore have systematically collected field data from instruments onboard – installing sensors and equipment which will allow users to visualize each parameter change throughout the processing plant onboard any of our Floating Production Storage and Offloading Units (FPSOs), and store these data in a modern data warehouse.

Leading the way in processing the enormous amount of data collected over the years is Abuhasan Sahibjan (VP Technical and Maintenance) and his team, who are designing platforms to allow colleagues to fine-tune operational parameters to maximize safety, maintenance and production goals. The team cleverly taps into currently available technology and hence does away with costly test-beddings and long implementation lead times.

Digital Lighthouse

BW Offshore has recently crossed a milestone in its digitalization strategy, with the successful go-live of Lighthouse, a digital platform which analyzes and displays real-time operational data.

Just as a lighthouse provides a navigational aid for vessels, BW Offshore has developed a digital lighthouse to provide a platform to allow for data collected from the thousands of sensors and equipment installed on our FPSOs to be analyzed

for maintenance and improvement initiatives. The Lighthouse pilot is a first step towards a vision of an integrated operations centre. Eight new large screen displays are mounted on to the walls in the operations and maintenance workspace of the Singapore Office. As the solution matures, implementation of Lighthouse may be extended to other offices worldwide.

Lighthouse aims to add value to our offshore units' operations by providing onshore staff with easier visualisation of operational status, supporting decision-making. It enhances personnel collaboration, thereby reducing the number of queries to the offshore unit and allowing those offshore to focus on running the facility.

Reflects Abuhasan, "When you have an issue onsite, the last thing you want is to be peppered with hundreds of questions to give context before you can get to the problem at hand. Lighthouse speeds up the understanding process by providing real-time data so we can all focus on what is truly important."

Lighthouse dovetails perfectly with its sister project, termed Remote Offshore Support and Survey (ROSS), which bridges the gap between offshore field work and technical experts onshore. Through use of Augmented Reality (AR), as well as audio and video streaming, ROSS enables real-time remote guidance to support the execution of complex maintenance, troubleshooting, remote inspections and surveys. ROSS was rolled out onboard BW Catcher in October 2019.



(Above) Key contributors to the Lighthouse: From Left: Nishad Madhavan, Peter Tham, Haja Najimudeen Abdul Jabbar, Murilo Picanco, Benny Fong.

It Takes a Village

Onboard BW Catcher, the ROSS system was tested by the offshore team and the onshore support team based in Aberdeen. Good interactive communication was established from the process modules onboard. Now, crew onboard can connect real-time to the support team located at the Aberdeen office and Lighthouse at the Singapore office.

A virtual tour of the offshore unit Joko Tole, located in the Java Sea in Indonesia, was made available along with the Lighthouse launch and was well-received by staff. The tour offers 360 degree views of the offshore unit in all locations, and is mapped to general arrangement floor plans. For staff

who have never been offshore, it was an eye-opener and a great learning opportunity. For seasoned offshore travelers, a virtual tour allows them to understand the possibilities of virtual reality and how work processes can be improved. Further plans are in progress to develop the tour to incorporate smart features, so that it can be used for safety inductions, engineering studies, maintenance activities, and audits and verifications.

Says Andrew Corbett, Offshore Installation Manager, "It is extremely encouraging to see BW Offshore committing to the use of modern technology to close the distance between onshore and offshore. The ability to get expert support out in the field as well as fast and reliable access to all relevant sources of information will



(Above) Straight line communication with Asset TAs onshore in real time and straight from the field.

undoubtedly contribute to safe and efficient operations. I commend Abuhasan and his team for their efforts in the digitalisation project and for making all our lives offshore that little bit easier." Adam Standen, Senior Electrician agrees. He says, "The ROSS system is a pioneering solution for remote operations and provides a "think outside the box" solution to many applications. These applications range from first line maintenance such as breakdowns and fault finding to first aid medical cases where support from an onshore doctor is required. A video or picture can sometimes replace hours of email exchanges and telephone conversations".

Adds David Newlands, Senior Mechanic, "I think we have just scratched the surface of what this technology can offer. Recently we contacted the reliability team with a live feed to discuss the issues that we were having. The ease with which the problem could be relayed and the ability for others to see exactly what we were experiencing in real time helped to resolve the problem in minutes rather than hours."

More Eggs to Hatch

The members of the Digitalization team are not resting on their laurels. Several other concurrent initiatives have been kickstarted which will utilize the IIoT (Industrial Internet of Things) infrastructure built up over the years for data acquisition, and will weave artificial intelligence into the mix. Projects include applying machine learning to equipment performance enhancement and predictive maintenance, as well as automated health

monitoring of critical systems, all of which have the potential to enhance the company's ability to upkeep the value of its offshore units and improve asset and safety performance, by helping stakeholders make informed decisions at the right time.

Hans Kristian Langsrud, Head of Asset Engineering and Maintenance, says, "The digitalisation project has been a success, and this is thanks to the team's ability to deliver low cost, high value solutions in a short time. Thanks to Abuhasan and his team, and excellent collaboration with IT and the offshore teams, BWO has started on its digitalisation journey and can now deliver solutions comparable to the best in industry. We are now in a position to build on this new technology for all assets and new projects."

Marco Beenen, CEO, compliments, "This is a true step forward for Digitalisation within BW Offshore, achieving many objectives like improving safety and reliability, improving communication between onshore and offshore, reducing operating costs, and greatly enriching the collective knowledge of the company."

Summarizes Abuhasan, "We would like to thank all the support received from the Senior Management, various Departments and the offshore team. We are excited to start reaping the benefits of close collaboration throughout the organization to grow the digitalization culture at BW Offshore. Together, we can achieve so much more." **wh**



(Above) ROSS Hardware handover to Catcher crew.

In the Spotlight

World Horizon speaks with Charles Maltby, CEO of Epic Gas

World Horizon [WH]: Welcome to BW! Please tell us a little about yourself.

Charles Maltby [CM]: Thank you, on behalf of the Epic Gas team of 1,300 seafarers and 125 ashore - we are pleased to welcome BW Group as our largest shareholder. I am British and together with my wife Penny, we have two grown boys. I've been honoured to hold the position of CEO of Epic Gas for the past five years.

Having spent time during my childhood growing up by rivers and sea, I was inspired to build a career in the marine industry. I took a degree in Maritime Business (International Shipping & Maritime Law), before joining Mobil Shipping in 1992, and then BHP Billiton in 1996. My career has offered me the chance to experience, primarily from a commercial perspective, many shipping sectors including aframax and product tankers, LPG, petrochemicals, and dry cargo

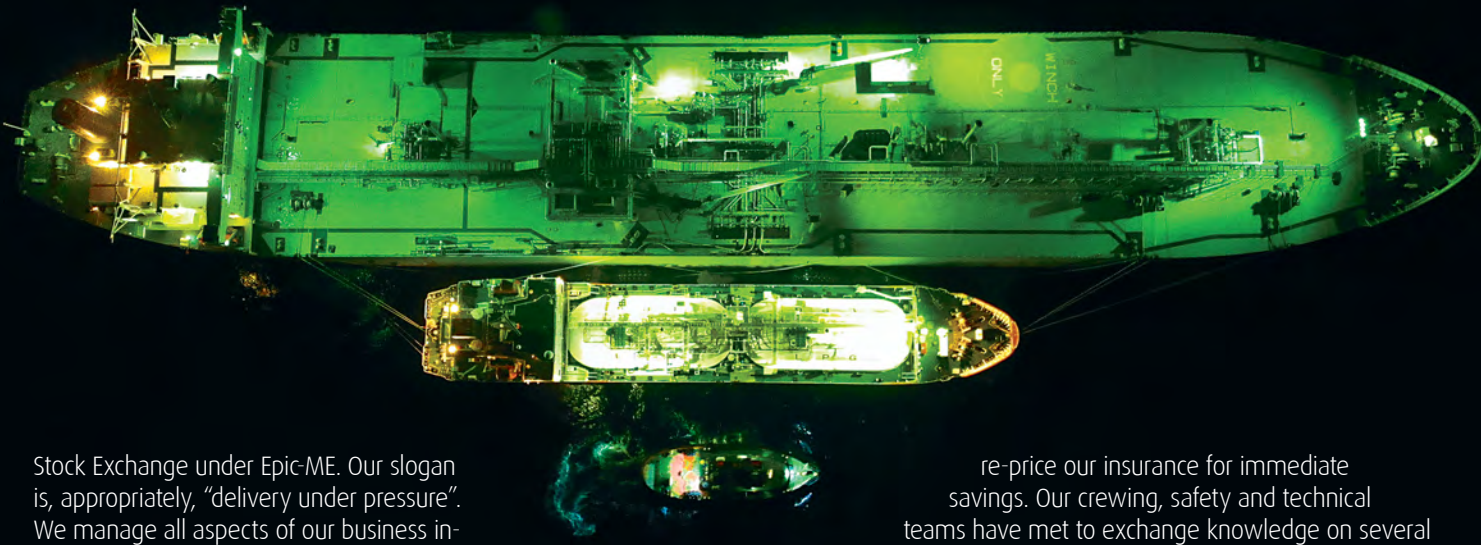
(coasters, handy, supramax, panamax and capesize). I spent the first half of my career working as a customer and building some clear views on the sort of service I would love a ship owner to offer; and the second half working with the fantastic teams previously at Pacific Basin, and now Epic Gas. I have been fortunate to live and work all over the world - building business relations, experience and friendships that help to knit the global shipping industry together. My favourite day at work is when I get to visit one of the Epic Gas ships, meet the officers and crew on board, and hear of their efforts to ensure #goalzero, our safety vision.

WH: In a nutshell, tell us a little about Epic Gas, and the niche the company occupies in the LPG trade.

CM: Epic Gas is a fully integrated owner and operator of pressurised LPG vessels, and we are listed on the Oslo Merkur



(Top) Charles on one of his many ship visits - eighth from left



Stock Exchange under Epic-ME. Our slogan is, appropriately, "delivery under pressure". We manage all aspects of our business in-house, including commercial, crewing, safety and technical, from a head office in Singapore, and have supporting teams in Manila, London and Tokyo. We currently operate a fleet of 44 vessels ranging in size from 3,500 up to 11,000 CBM, and they are all built in Japan with an average age of eight years.

We are focused on providing leading shipping services in our sector to our customers globally. It is estimated that the pressurised LPG fleet moves over 10% of the 96 million tonnes per annum of global LPG seaborne trade. Epic Gas moves three million tonnes a year, of which about 75% is LPG, and the balance petrochemicals. Our typical trades are "last-mile" trades into smaller regional ports often in developing economies, where the LPG is often destined for the bottled gas market for use in cooking, heating, auto-gas, or smaller scale power plants. This means our average voyage time at sea is about five days, with over 2,700 cargo operations performed in 2018. Of these operations, about 15% are ship to ship transshipment operations, where we load from larger vessels at over a dozen locations worldwide, including BW LPG's Berge Summit (pictured on the previous page), for discharge into restricted ports.

WH: How have things been since the BW Group investment?

CM: Epic Gas has always prided itself on being a busy company, with a strong focus on our vision, mission and values (VMV). We are also evolving daily and the past six months have been very busy. The warm welcome from all members of the BW Group have made it an easy introduction, and the similarities in our VMV are helping us to quickly settle into a close and productive working relationship. The investment by the BW Group alongside our other shareholders has enabled us to add four second-hand 11,000 CBM from Petredec at a cost of US\$106.5M, which required a US\$60M equity raise and the onboarding of two new financing banks, BNP and Danish Ship Finance. We would not have achieved the equity raise or an improved finance margin without the support of BW Group. All four of these vessels, which were delivered in July, are trading profitably.

Our finance teams are now working closely on ideas for further debt financing, budgets, and corporate structures. Our insurance team has worked alongside the BW Group insurance team to

re-price our insurance for immediate savings. Our crewing, safety and technical teams have met to exchange knowledge on several areas including dry-dockings, Ballast Water Treatment Systems and IMO 2020. Our operations team is working with Hafnia to ensure access to high quality low sulphur bunker solutions. I look forward to collectively finding further ways to share knowledge and strengthen our respective businesses, as we strive to embrace the necessary environmental and digital improvements.

WH: What are your priorities for 2020? What are the challenges and opportunities you foresee?

CM: We start each day with safety as our top priority. We are keen to make the most of the improving market fundamentals and deliver a safe profitable business. To be leaders we must make continuous investments in our training ashore and afloat, follow through on specific digitalisation and environmental initiatives, and deliver improvements in business efficiency. Despite our fleet being over 40 vessels, 15,000 ship days, or 2,700 port operations – every 1% counts. Therefore attention to detail is paramount in ensuring we deliver a safe and cost effective operation for our customers. We are also keen to increase our diversity and inclusivity as an organisation, with specific plans ashore and afloat that will increase access to well-trained colleagues. Finally, it is very important to have fun while being busy!

WH: Tell us a little-known fact about yourself.

CM: My first job was as an over-locker (a sewing machinist) in a textile mill and it was there where I learnt the importance of communication, teamwork and humility – whilst observing most people work their socks off every day to provide an income for their family. Also, whilst exploring which part of the shipping industry to join, I spent time with the UK Royal Navy including with their aviation arm. During my stint, I passed the helicopter underwater egress training (where they strap you into a helicopter upside down and drop you into the water in the dark), and onboard damage control with fire-fighting training. All these made me understand the necessity to plan for the worst, develop communication and teambuilding skills, whilst keeping calm during a bad day in the office. **wh**

Navigating the Amazon River

World Horizon explores the unique challenges of delivering energy via one of the world's most famous rivers



BW Group is one of the world's leading maritime energy transportation and gas infrastructure companies. Our vessels are usually associated with deep sea shipping, where they trade long routes and connect supply with demand globally. BW is however represented across almost all segments of the energy value chain, and Epic Gas, in which BW Group is the largest shareholder, is an example of a company specializing in regional, short-haul or 'last-mile' trades. Epic Gas is the largest owner and commercial operator of small pressurized Liquefied Petroleum Gas (LPG) carriers. It operates a fleet of 44 smaller-sized vessels ranging from 3,500 to 11,000 cbm, participating in the movement of both Liquefied Petroleum Gas (LPG) and petrochemicals around the globe. World Horizon shines the spotlight on a particular short-haul trade, in one of the world's most famous rivers – the Amazon River in Brazil.

Energy in Brazil

Brazil is a global leader in renewable energy generation, as well as the consumption of cleaner energy. Brazil has been using LPG as cooking fuel since 1937¹. Total LPG demand in 2018 was 7.8 million tons and is expected to grow to 8.9 million tons by 2025. LPG is sold to over 41 million households, mainly for cooking, with LPG cylinders accounting for about 80% of total demand. Most of Brazil's LPG comes from domestic sources; with four million tons from refineries and another 1.2 million tons from gas plants. The seaborne distribution of domestically produced LPG is via smaller LPG carriers on the Amazon River and along the coast. Brazil's seaborne imports of LPG were approximately 2.5 million tons in 2018, which were mostly transported on larger vessels. Imports are expected to decline as LPG supplies from domestic gas plants continue to increase.

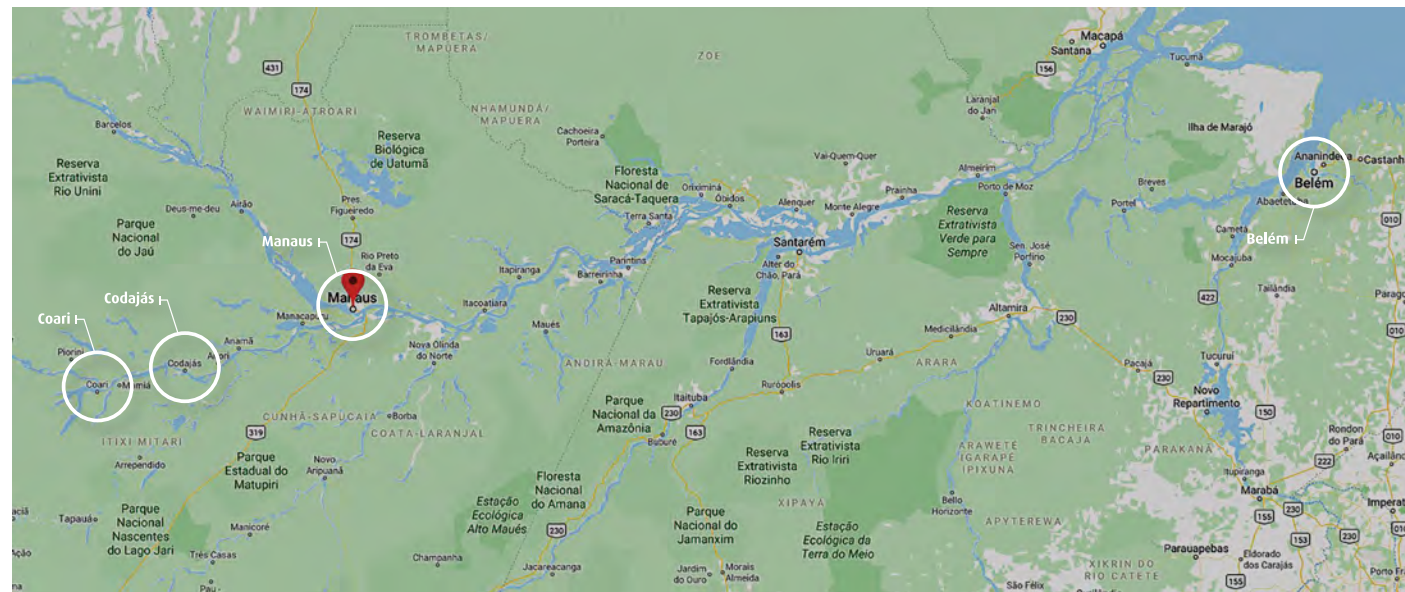
The largest onshore natural gas reserves in Brazil, the Urucu fields, are in the southern Amazon region of Coari. Occupying 10,000 hectares, there are 60 production wells in three fields and total reserves are estimated at 537 million barrels of oil equivalent (mboe). Oil, natural gas and LPG are processed at Polo Arara, and oil and LPG are first piped to the Solimões terminal, where they are then transported by vessels to the Isaac Sabbá refinery in Manaus and sold to LPG markets in the states of Pará, Rondônia, Maranhão, and part of Ceará and Pernambuco.

Epic Gas in Brazil

Epic Gas has been trading on the Amazon River since 2016, with four LPG vessels plying this trade over the intervening period. Chartered by Petróleo Brasileiro S.A., the vessels, Epic Barnes (7,200cbm); Epic St. George (5,000cbm); Epic St. John (5,000cbm); and Epic Baluan (7,500cbm), have to-date safely performed 106 voyages in Brazil of which 97 voyages were on the Amazon River. These vessels call at Belem, Manaus and Coari, which are key ports along the Amazon River. Belem is approximately 1,261 nautical miles from Coari, and a round trip takes about two weeks.

Navigating the River and the Seasons

Shifts between the dry season and wet season in Brazil bring about dramatic changes to the Amazon River. In some areas, water levels rise more than 14 meters above regular water levels and completely change trading patterns between Coari and Belem. During the wet season (December to July) a vessel sailing between Belem and Coari must make an additional stop in Manaus to wait for its berthing schedule at Coari, due to a lack of anchorage space. Once berthing space is available, vessels will then sail for about a day to reach Coari, where they are loaded



(Above) Google Map showing the ports of Belem, Manaus, Codajás and Coari. A round trip between Belem and Coari takes approximately two weeks.

¹Oswaldo Lucon, Suani Teixeira Coelho and José Goldemberg, São Paulo State Environmental Secretariat, "LPG in Brazil: lessons and challenges" in *Energy for Sustainable Development*, Volume VIII(3), September 2004, online.



(Above) Captain Francis P. Marañon, Master of LPG Carrier Epic Baluan on the Amazon River

with cargo before sailing to the port at Belem for discharge. The passage from Coari to Belem lasts about four days and two to three pilots are employed to assist with the navigation.

During the dry season (August to November), water levels in the Amazon River drop and trading patterns change. Smaller vessels with smaller drafts such as Epic St. George are used – these smaller vessels load at Coari and discharge at Manaus or at Codajás, a port located ten hours away from Coari. Ship-to-Ship (STS) transfers are also common during the dry seasons, with Epic St. George loading at Coari and discharging its load into larger vessels such as Epic Baluan at Codajás, which then sail onwards to Belem for discharge.

Perks of the Trade

The Amazon represents over half of the planet's remaining rainforests and comprises the largest and most biodiverse tract of tropical rainforest in the world, with an estimated 390 billion

individual trees divided into 16,000 species². The Amazon River is the largest river by discharge volume of water in the world, and by some definitions it is also the longest. The river and rainforests are also home to immense biodiversity - fish such as the red-bellied piranhas, the Tambaqui (Giant Pacu) and Pirarucu (Arapaima Gigas) are part of global popular culture due to documentaries and movies³.

Surrounded by lush tropical rainforests, the view from onboard is the envy of many. The vessels regularly cross a passage called "The Meeting of Waters" or Encontro das Águas, one of the main tourist attractions of Manaus. The dark waters of the Rio Negro and the pale sandy-colored (whitewater) of the Solimões River meet, and for six kilometers the two rivers' waters run side by side without mixing due to differences in temperature, speed and water density. World Horizon speaks with Captain Francis P. Marañon, Master of LPG Carrier Epic Baluan to understand more about his work onboard an LPG carrier and trading in the Amazon River.

²"Field Museum scientists estimate 16,000 tree species in the Amazon". Field Museum. October 17, 2013. Retrieved October 18, 2013.

³Movies such as *Medicine Man* (1992), *Anaconda* (2004), *Amazonia* (2013), *Piranha* (2013) and *The Lost City of Z* (2016) are depictions of the Amazon Rainforest in popular culture.



(Top) An aerial view of the Amazon River; (Bottom, Left and Right) Under the Water: The Pirarucu (*Arapaima Gigas*) and Tambaqui (*Giant Pacu*) are common wildlife in the Amazon River, and a staple in the local community's diet



(Above) Meeting of Waters - a naturally occurring six kilometres long confluence between the dark (blackwater) Rio Negro and the pale sandy-colored (whitewater) Amazon River.

World Horizon [WH]: Tell us about yourself and how you became a Captain with Epic Gas?

Captain Francis P. Marañon (FM): I am the ninth of 11 children in my family. I graduated from high school in 1991 and a seafaring career was a popular profession in my community. I graduated with a Bachelor in Science and Marine Transportation (Honors) from the Visayan Maritime Academy in 1994. I started sailing in 1995 as a deck trainee and have since sailed on many types of vessels - container vessels, oil tankers, chemical carriers, pressurised, semi-refrigerated, refrigerated and ethylene vessels. In 2011, I was promoted to the rank of Captain and in 2016, I joined Epic Gas and have not looked back.

WH: How did you end up becoming an expert of the Amazon River? What is it like sailing on the Amazon River?

FM: Being on the river like the Amazon is not unusual to me as most of my years sailing in Europe, UK and France were always on rivers – such as the Scheldt, Rhine, Rouen, and inland Japan and China. The Amazon River is of course special, as it is home to amazing wildlife and is flanked by dense rainforests. The Amazon River is a “monstrous” thing – very dominant in the community, very long, and constantly changing. On the Amazon River, you see ferry boats; small barges crossing from one place to the other carrying passengers and cargo; and local fishing boats trying to catch freshwater fish for food and for sale. During the wet season, you can encounter uprooted trees taken away by rushing river currents.

WH: What is the favorite and least favorite part of your job?

FM: I enjoy ship handling and maneuvering - it is truly an art to use whatever means within your control so that you work with and not against Mother Nature. Water currents in the Amazon River flow at three to five knots and we must take this into consideration during berthing/unberthing operations

and STS transfers. My least favorite part must be the insects – which come in all sizes and range from harmless to a fast-pass to the doctor's office. While sailing along the river or at port, a lot of insects try to join us onboard. There are spiders, mosquitos, flies, and insects whose bites can cause burns and swelling.

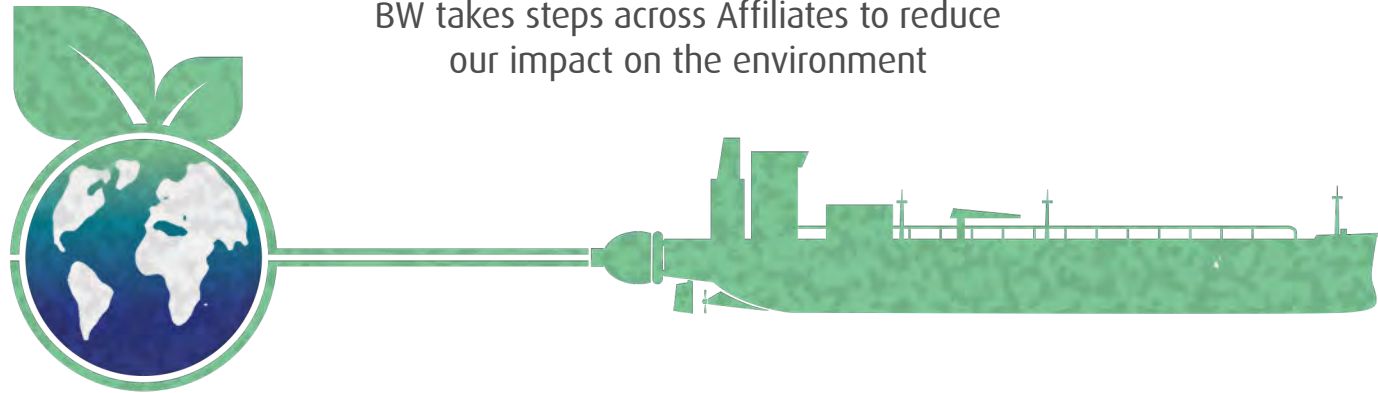
We are currently at the end of the dry season. Even experienced pilots, some of them with more than 20 years under their belts, seem to be surprised by the changes in the river. This year, Solimões River created a brand-new area with shallow waters. There are only a few passages, surrounded by banks, which remain passable to vessels. Along these narrow passages, the river currents have a strong effect on our vessels as we pass. The river currents, which are currently close to five knots, will create squats, bow cushions and bank suction, and these are unique conditions that we must understand and work with to always maintain sufficient keel clearance. This demands a lot of experience from the bridge team and pilots. We always try to avoid meeting other vessels in shallow and narrow areas by communicating closely with vessels that are close by, typically one of the vessels reduces speed so that we can pass safely. Pilots, the Brazilian navy, and private surveyors constantly monitor the depths of waters all over the Amazon River. Precise position fixing and using parallel indexing by radar are important tools to help us with navigation as the river constantly changes. We also monitor pilot helm orders and advice, and plan our passages accordingly. Each voyage is a unique experience, and we who sail on one of the largest rivers in the world are very lucky.

WH: Any thoughts on your relationship with the local community?

FM: I strongly believe that what we do is meaningful - we provide safe transportation of clean energy through the Amazon River, and this energy powers the basic needs of the local communities. Ports along the Amazon River which service our vessels provide jobs to the locals as well. Practically, we play our part by making sure we minimize garbage production onboard, ensure proper containment and dispose of all garbage correctly and as per all regulations. **wh**

Running the Sustainability Marathon

BW takes steps across Affiliates to reduce our impact on the environment



The United Nations has called climate change the defining issue of our time and urged world leaders to recognize that humanity is at a critical moment. After more than a century and a half of industrialization, deforestation, and large-scale agriculture, quantities of greenhouse gases (GHG) in the atmosphere have risen to record levels. From shifting weather patterns that threaten food production to rising sea levels that increase the risk of catastrophic flooding, the impacts of climate change are global in scope and unprecedented in scale. Without committed action today, adapting to these impacts in the future will be both more difficult and costly.

The Role of Shipping in Climate Change and Sustainability Discourse

Although shipping is an industry that feels foreign to most people, it touches over 90% of world trade by acting as the foundation for the global movement of goods. As a facilitator of modern life, shipping is inextricably linked to the concern of climate change and the need for more sustainable behaviour. Yet, shipping is the most carbon efficient way of moving goods and connecting countries. A large vessel produces less than 20 grams of CO₂ per

tonne-km, whereas a truck produces two and a half times as much (in other words 50 grams per tonne-km) and a plane produces almost 30 times as much (about 550 grams). Still, because of humanity's dependency on ocean transportation, the shipping industry is indeed a significant contributor to global emissions.

How can the Shipping Industry Reduce Its Environmental Impact?

A broad examination of where international shipping can play a part in reducing its environmental impact arrives at some possible areas of focus – from efficiency improvements in logistic chains, to actions by international bodies such as the United Nations (UN) and International Maritime Organization (IMO), and finally the independent decisions of companies and individuals. Of course, across this spectrum, some pathways will seem unfeasible, and others more realistic. An example of a great challenge is the optimization of global energy flows. This is a matter of geopolitics and national security - it does not make great sense for Venezuela to export crude oil to China while Brazil imports refined oil products from the Middle East, nor for LNG to travel

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ESG BY THE NUMBERS

#1

WORLD-FIRST
LPG PROPULSION

97%

REDUCTION IN SULPHUR OXIDES

SULPHUR DIOXIDE DOWN BY	PARTICULATE MATTER DOWN BY	GREENHOUSE GASES DOWN BY	NITROGEN OXIDES DOWN BY
97%	90%	25%	20%

0.1%

BW IS IN FULL COMPLIANCE WITH EMISSION CONTROL AREAS (ECAS) AND SULPHUR EMISSION CONTROL AREAS (SECAS)

0.5%

SULPHUR EMISSIONS CAP

READY & AHEAD OF IMO2020'S STANDARD

\$140 MILLION

BW VENTURES

INVESTED IN ENVIRONMENTAL & TECHNOLOGY RELATED INITIATIVES

50%

MARKET SHARE

BW IS THE LARGEST SHAREHOLDER IN THE LEADING BATTERY PROVIDER FOR THE MARITIME INDUSTRY

CORVUS ENERGY

67,206,602

LITRES DIESEL SAVED

180,287

METRIC TONS OF CO₂ REDUCED

GLOBAL CARBON PRICING PROPOSAL CHAMPIONED BY BW AND OTHER LEADING COMPANIES

\$8-60 BILLION

PER ANNUM

DEVOTED TO DECARBONISATION

97

NIGERIAN CADETS' MARITIME UNIVERSITY EDUCATIONS FULLY SPONSORED

>4000

SEAFARERS PARTICIPATING IN BW'S WELLNESS PLATFORM

20

DISTINCT MENTAL HEALTH COURSES AVAILABLE TO SEAFARERS

50

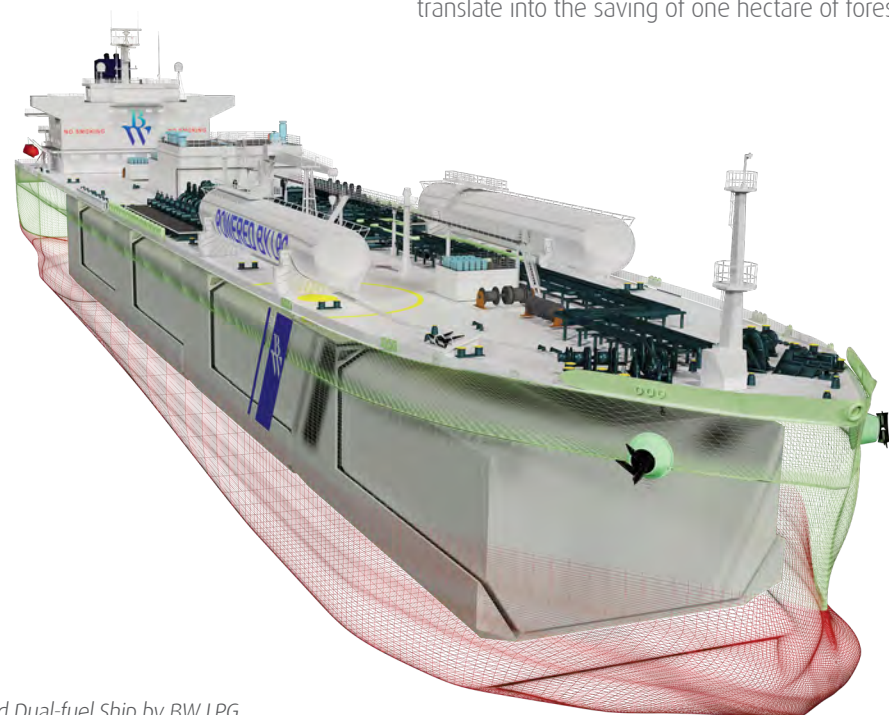
% FEMALE HEADS OF DEPARTMENT AT BW GROUP AND FEMALE REPRESENTATION ON THE BOARD OF ALL AFFILIATES

From Compliance to Opportunities

Hafnia – Optimizing Fleet Operations and Supporting the “Now”

As a newly formed company from the merger of BW Tankers and Hafnia Tankers, Hafnia is taking steps, especially on the operational front, to ensure a minimal environmental footprint. Being one of the world’s largest transporters of hydrocarbons, Hafnia recognizes its responsibility. Hydrocarbons run our planes, trains and automobiles; power our homes; and are used to make the roads that connect our cities. From clothes to cleaning products, packaging and pharmaceuticals, the world relies heavily on hydrocarbons. Safe and responsible transportation around the world is therefore vital to upholding modern life.

The company is voluntarily ISO 14001:2015 certified, practices a robust fleet environmental management plan with measurable goals and targets on emissions and waste reduction, and is in the process of finalising a future-ready IT platform that will allow us to reduce emissions and increase efficiency. Beyond operations, Hafnia participates in industry groups and initiatives. One example is the “Green Ship of the Future” project, where Hafnia provided a group of participating companies with data from Medium Range Product Tanker Hafnia Lise for analysis, so that suppliers could suggest ways to improve vessel optimization through practical initiatives such as boiler upgrades, shaft generator installation, and wind rotor sails. More strategically, Hafnia also participates in other industry initiatives such as Zero Emission by SHIPLAB and the Getting to Zero Coalition, where industry members will soon work together to map out the design of scalable Zero Emission Vessels (ZEVs).



An artist impression of a retrofitted Dual-fuel Ship by BW LPG

BW LPG – Dual-fuel propulsion engines

BW LPG provides a good example of a company making longer-term strategic investments in sustainability. In August 2018, BW LPG committed to the delivery and retrofitting of four LPG-propelled dual-fuel engines in its fleet, making the company a global pioneer in LPG propulsion. With LPG propulsion, BW LPG will reduce its sulphur oxide emissions by up to 97 percent, allowing for full compliance with all current and future sulphur emissions requirements. This means the retrofitted ships, when operating on LPG, will go beyond IMO’s global 0.5% sulphur emissions cap to also be in full compliance with Emission Control Areas (ECAs) and Sulphur Emission Control Areas’ (SECAs) 0.1% sulphur cap. In addition, with LPG fuel, BW LPG will reduce emissions of particulate matters by over 90 percent, greenhouse gases by over 25 percent, and nitrogen oxides by over 20 percent. From an operational perspective, LPG propulsion translates into cleaner, more efficient engines that are cheaper to maintain. The fuel flexibility of dual-fuel engines also ensures full redundancy for uninterrupted operations.

BW LPG is also a firm supporter of World LPG Association’s Cooking for Life Campaign which aims to facilitate the transition of one billion people from cooking with traditional fuels, as well as other dirty and dangerous fuels, to cleaner-burning LPG by 2030. Around three billion people across the developing world still rely on solid fuels – traditional biomass or coal – for cooking on basic stoves or open fires. The health consequences of solid fuel use have been well documented. Indoor smoke from solid fuels is the 10th leading cause of avoidable deaths worldwide. It is the second most common environmental cause of disease after contaminated waterborne diseases (WHO, 2012). Switching 100 households from consuming 200 tons of harvested wood a year to 1.8 tons of LPG would also translate into the saving of one hectare of forest per year.

BW LNG – Investments in Gas Infrastructure

As a Group, BW has also made significant investments in the LNG segment. We are working to build marine-based infrastructure to facilitate the provision of cleaner energy, especially gas. BW LNG manages a fleet of 27 LNG vessels and Floating Storage and Regasification Units (FSRUs). These vessels are equipped with highly efficient 2-stroke engines and reliquefaction capacity, in addition to improved tank insulation. One of BW LNG’s newbuildings, the FSRU BW Magna, will be supporting one of the world’s largest greenfield LNG to power projects in Port Açu, Brazil. The Port Açu Gas Hub consists of two power plants, with the first scheduled for start-up in 2021 and the second scheduled for start-up in 2023. Located 350km north of Rio de Janeiro, BW Magna will be delivering cleaner energy to the communities in the vicinity. A small but interesting operational change that BW made, in line with its larger efforts to reduce its environmental impact, was to paint BW Magna’s green hull to blue, as field evidence suggests that some wildlife, including endangered species of turtles found in the Port Açu area, are attracted to shades of green, putting them at potential risk from operations.

BW Ventures – Investments in Energy Storage Systems

BW, through BW Ventures, has assessed and invested in many companies with applications across the maritime space. We are well placed to provide not only capital but also management support for the companies we invest in. One example is Corvus Energy, the market leader of large-scale energy storage systems for ships. Corvus Energy has been a pioneer in this market for almost a decade and has a clear leadership position with more than 140 installations and over two million operating hours. BW views electrification as a global macro-trend, and energy storage

is a critical piece of the puzzle. As fuel efficiency concerns have moved up the agendas of all companies, combined with a marked decrease in battery costs, there are now very high growth rates across several vessel segments for batteries. In 2014, the total market for large scale marine energy storage systems was less than 10-megawatt hours (MWh), in 2016 it had increased to about 18 MWh, and the market is expected to exceed 100 MWh in 2019 and continue with an upward trend in the coming years.

A Marathon, Not a Sprint

It is vital to acknowledge that sustainability issues go beyond GHG emissions and IMO2020. We are constantly working with our partners to better align our activity with the United Nations Sustainable Development Goals and broader ESG-related considerations. We understand that sustainability and profit are not conflicting goals, but that the latter is dependent on the former. Profits are essential to sustaining a business, but businesses can only traverse cycles when their products and services have some underlying social function. The discussion is far more complex as there are often trade-offs to be made – at what cost do we seek to maximise profit? How do we factor in environmental and social implications? There has been a noteworthy shift in thinking regarding the role of business in society.

Without easy solutions to the challenge of climate change, each company needs to have its own internal discussion to determine a sustainable course and collaborate with others to chart this course. BW’s updated mission to “deliver energy for the world today, and find solutions for tomorrow” reminds us that we must act sustainably to serve both the needs of the present and the future. If we keep this at the forefront of our minds while conducting our business, we will find over time that we can do good while doing well. **wh**



Cooking For Life

BW LPG supports the World LPG Association's push to improve the lives of billions of people through use of cleaner-burning fuels such as LPG for cooking

OVER 4 MILLION PEOPLE DIE PREMATURELY FROM ILLNESS ATTRIBUTABLE TO **HOUSEHOLD AIR POLLUTION** FROM COOKING WITH SOLID FUELS

MORE PEOPLE DIE FROM COOKING-RELATED INDOOR AIR POLLUTION-CAUSED ILLNESS THAN FROM MALARIA, HIV/AIDS AND TUBERCULOSIS COMBINED

AROUND 3 BILLION PEOPLE COOK AND HEAT THEIR HOMES USING OPEN FIRES AND SIMPLE STOVES BURNING BIOMASS, KEROSENE AND COAL

PEOPLE EXPOSED TO INDOOR SMOKE ARE 2-3 TIMES MORE LIKELY TO DEVELOP CHRONIC OBSTRUCTIVE PULMONARY DISEASE

BURNING WOOD AND COAL PRODUCES AROUND 150 TIMES MORE CARBON MONOXIDE (CO) THAN LPG, PER GIGAJOULE OF ENERGY

IN 2014, 92% OF THE WORLD POPULATION WAS LIVING IN PLACES WHERE THE WHO AIR QUALITY GUIDELINES LEVELS WERE NOT MET

OUTDOOR AIR POLLUTION IN BOTH CITIES AND RURAL AREAS WAS ESTIMATED TO CAUSE 3 MILLION PREMATURE DEATHS WORLDWIDE IN 2016

SEVERAL CITIES HAVE MANDATED THE USE OF AUTOGAS FOR BUSES AND TAXIS TO ADDRESS AIR POLLUTION

THERE ARE OVER 25 MILLION AUTOGAS VEHICLES IN USE TODAY WHICH MAKES IT THE MOST POPULAR ALTERNATIVE FUEL

PROGRAMMES TO PROMOTE THE USE OF LPG IN DEVELOPING COUNTRIES HAVE HAD AN IMMEDIATE AND PROFOUND IMPACT ON PEOPLE'S LIFE AND THE ENVIRONMENT

In the context of the development goals of the global community, the World LPG Association (WLPGA) launched the Cooking For Life campaign in 2012, with the aim to transition one billion people from cooking with traditional and other dirty and dangerous fuels to cleaner-burning Liquefied Petroleum Gas (LPG) by 2030. By convening governments, public health officials, the energy industry and global NGOs, this campaign explores practical ways of expanding access to LPG in the

developing world to improve the lives of billions of people whose health and safety are threatened by cooking with solid fuels.

Cooking For Life focuses on communicating the benefits of switching populations from cooking with biomass and other dirty and dangerous fuels to cooking with LPG. Ranging from key studies and reports to marketing initiatives, workshops and participation in public events, the WLPGA has provided good industry practices and policy tools to grow the industry in a safe and sustainable manner.



(Above) Our BW LPG team of marathon finishers in this year's Standard Chartered Singapore Marathon

Benefits of LPG as a Cooking Fuel

Switching to LPG improves the quality of life and brings far-reaching environmental and economic benefits. LPG produces virtually no particulate matter and low emissions of carbon monoxide compared to most non-renewable fuels. Emissions of toxic gases that can cause serious health problems if inhaled are negligible, making LPG highly suitable as a household cooking fuel. The economic benefits include the reduction in health-related expenditure and productivity gains that result from less illness and fewer deaths, as well as the time saved in collecting traditional fuels. The total economic benefits of half of all the people using solid fuels worldwide switching to LPG are estimated at around US\$90 billion per year compared with net intervention costs of US\$13 billion.

Supporting the Initiative

As the leading maritime carrier of LPG, and living up to our aim to deliver clean energy for a sustainable world, BW LPG believes in the Cooking For Life campaign and is committed to

supporting WLPGA in this admirable cause. Since our inaugural participation in 2016, a team of employees has participated in the Standard Chartered Singapore Marathon every year, under our Running for Life initiative. Not only does this inspire a healthy lifestyle amongst BW LPG employees, we are also dedicated to donating a monetary amount towards projects that fall under the Cooking For Life campaign, for each employee taking part in the 5km, 10km, half marathon and full marathon races.

A Call to Action

Spreading the word and raising awareness on the dangers of using traditional fuels for cooking and the detrimental impact this can have on health and daily lives for three billion people worldwide will go a long way to effect change. By doing so, the Cooking For Life campaign can put the necessary tools and resources in the hands of energy policy decision makers in developing countries and support leaders with best practices and lessons for implementing successful LPG conversion programmes. **wh**

DID YOU KNOW?



- **3 billion** people across the developing world, mainly in rural areas in sub-Saharan Africa, India and other developing Asian countries, still rely on traditional biomass, coal or kerosene for cooking on primitive stoves or open fires.
- Exposure to indoor air pollution from cooking in this manner causes the premature deaths of up to **4 million** people annually from lung cancer, cardiovascular disease, pneumonia and chronic obstructive pulmonary disease.
- The WLPGA initiative has set a target of **1 billion people switching to LPG from biomass coal or kerosene by 2030.**

Energy delivered

BW thanks the Royal Navy and international coalition forces for supporting the global transportation of energy during troubled times



(Top and Bottom, Left) BW vessels transiting the Strait of Hormuz under close escort by the Royal Navy; (Bottom, Right) Duty Watch Team at UK Maritime Trade Organisation (UK MTO) base in Portsmouth, UK.



The Strait of Hormuz, the narrow stretch of water between the Persian Gulf and the Gulf of Oman, is regarded as one of the world's most important passages for international trade. It provides the only sea passage from the Persian Gulf to the open ocean, with almost one-fifth of global oil production and one-third of the world's LNG passing through it. The Organization of the Petroleum Exporting Countries (OPEC) members Saudi Arabia, Iran, the UAE, Kuwait and Iraq export most of their crude via the Strait; and Qatar, the world's biggest liquefied natural gas (LNG) exporter, sends most of its LNG through this channel.

Troubled Times

In May 2018, amidst global political tensions over trade sanctions, four vessels reported attacks in the Gulf just outside the Strait. A month later, a similar incident happened involving two tankers, one Norwegian and the other Japanese. These tensions eventually culminated into the seizure of the British-flagged tanker *Stena Impero* by Iran on 19 July. As a result, from late July, the UK government announced that it would provide Royal Navy escorts for British-flagged ships passing through the Strait of Hormuz.

Serving Society Through Energy Delivery

Very Large Gas Carrier *BW Elm* was the first British flagged tanker to pass under escort through the Strait of Hormuz after Iran's seizure of the *Stena Impero*. BW LPG followed developments in the Strait of Hormuz closely and had asked all vessels to proceed with additional vigilance and to follow appropriate security protocols in place. BW LPG also liaised closely with all relevant authorities such as flag, class, and insurers and operated at its highest security protocol.

Explains Captain Geoff Pearson, BW Group's Global Head of Fleet Security, "We have a very robust system to assess risks, and I am proud that we have been able to deliver energy safely and reliably for our customers and the communities we serve. All our vessels took extreme caution, such as transiting the area at maximum safe speed during the hours of daylight, keeping away from the troubled coast, posting extra lookouts, monitoring the VHF closely to follow all instructions from coalition forces, and treating unidentified vessels and small craft with caution."

He adds, "In total, BW made 24 transits with the invaluable assistance of the Royal Navy. We wish to extend our sincere appreciation for their professional assistance, and for supporting the continued and vital flow of energy even during troubled times." **wh**

Evaluating a Carbon Levy

Could a carbon levy in shipping be an effective way to help reach the IMO greenhouse gas reduction goals?

Two options dominate discussions on global emissions regulation – a carbon levy or a carbon trading scheme. BW fully supports the implementation of a levy for shipping. BW, BHP, DNB and DNV GL produced a White Paper to facilitate a discussion at the 2019 Global Maritime Forum (GMF) held in Singapore on 30 and 31 October. This White Paper is reproduced in the following section.



Why Are We Producing This Paper?

This paper is prepared to facilitate a discussion at the 2019 Global Maritime Forum (GMF) in Singapore on whether and how a carbon pricing scheme could support greenhouse gas (GHG) reduction targets, including IMO's 2050 GHG ambitions. It should not be viewed as a comprehensive position or policy paper, but rather as a document to stimulate discussion within the shipping industry.

There is a need for the shipping industry to find ways to reduce its GHG emissions. While there is agreement at the International Maritime Organization (IMO) on carbon reduction goals for international shipping, we believe that the industry has a responsibility to find solutions for the carbon challenge, and that an increasing global attention on carbon pricing mechanisms may result in regulatory action.

There are multiple pathways to reduce carbon - new fuels, technologies, and operational approaches. Most of these require significant investment; some can provide financial returns over time; but in the absence of a carbon pricing mechanism that provides disincentives for consumption of carbon intensive fuels, and incentives for research and development, it is unlikely that we can achieve meaningful decarbonization.

While there are other incentive mechanisms to promote the adoption of new solutions, in this paper we focus on carbon pricing as an effective means to do so. We are only considering CO₂ as it is the primary GHG.

We would like to engage maritime industry players in discussing how a carbon pricing scheme could be designed to deliver the necessary outcomes in a manner that is structured, transparent and provides a level global playing field.

This paper addresses the following key questions:

- Does carbon pricing work and what type of carbon pricing scheme is preferred for shipping?
- How should the price on carbon be determined?
- How should proceeds be collected and enforced?
- How should the proceeds be deployed?

Background and History

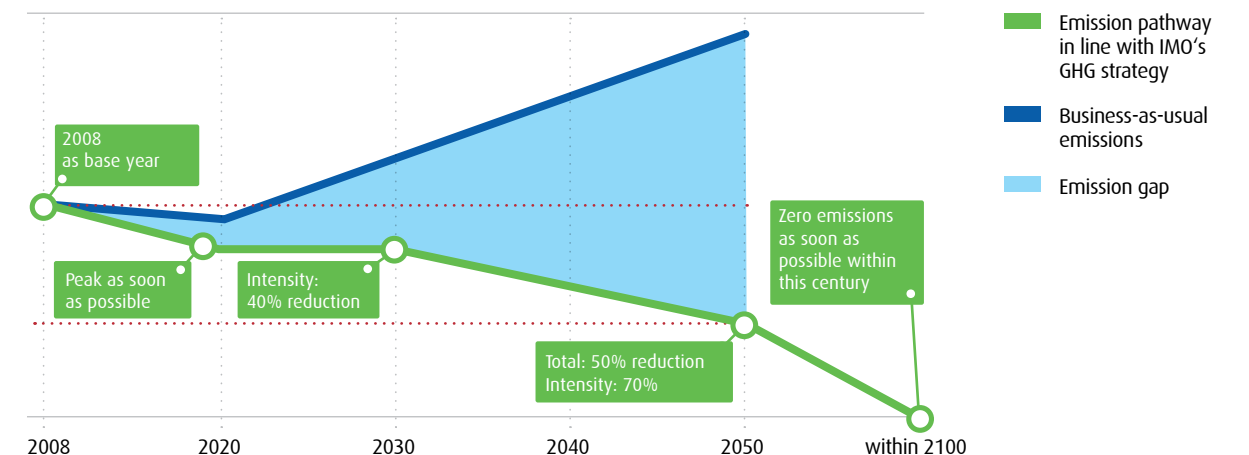
International shipping is responsible for approximately 2% of the world's CO₂ emissions [1]. This corresponds roughly to the emissions of sizeable countries such as Germany or Japan. However, while most countries are parties to the Paris Agreement and thereby formally committed to emission reductions to keep global warming to well below 2°C above pre-industrial levels and to pursue efforts to limit the temperature increase even further to 1.5°C, shipping and aviation are not included.

In response to the Paris Agreement, the IMO has committed itself to an emission reduction strategy to phase out GHG emissions as soon as possible within this century. The strategy contains several intermediate steps, a key one being to reduce total GHG emissions by at least 50% in 2050 compared to 2008.

Presently, the IMO is engaging primarily in a discussion of technical and operational policy measures and focuses on what can be agreed in the short term, i.e. measures intended to come into force by end-2022. Carbon pricing is not yet a significant part of these discussions but has been proposed in the IMO GHG strategy as a measure for the medium and long-term. As the IMO works by the consensus of member states, a proposal on carbon pricing will take time to be agreed and implemented.

IMO strategy for major reductions in GHG emissions from shipping

Units: GHG emissions



Total: Refers to the absolute amount of GHG emissions from international shipping.

Intensity: Carbon Dioxide (CO₂) emitted per tonne-mile.

Source: DNV GL [2]

Does Carbon Pricing Work and What Type of Carbon Pricing Scheme is Preferred for Shipping?

The purpose of carbon pricing in shipping should be to help reach the IMO GHG emission reduction goals for 2050 by providing financial incentives to invest in emission reduction technologies and solutions. Additionally, a carbon pricing mechanism can be used to raise funds for research, development, and scaling of alternative fuels and technologies.

Carbon pricing schemes can be divided into two general types:

Emissions trading systems (ETS) - sometimes referred to as a cap-and-trade system – where a cap is placed on emissions, and allowances are subsequently traded. The ETS establishes the price indirectly by placing a limit on the total quantity of emissions allowed. This limit is enforced with tradable emission permits, typically called “allowances”, that any emitter must use to cover its emissions. The market for these tradable allowances leads to a carbon price based on demand and supply. Under an ETS, overall emission levels are clear (equal to the cap), but the resulting carbon price is uncertain because it is determined by free market forces through supply and demand. Generally, an ETS does not create excess funds for other purposes such as R&D, as all transactions happen between stakeholders. However, the auctioning of allowances could be used to generate funds.

Carbon levy – this is where an explicit price is placed on CO₂, or alternatively imposed through other costs that imply a carbon price. Under a carbon levy, the cost of controlling emissions would be certain (it would be equal to the levy), but because there is no predetermined limit on emissions, the overall volume of emissions is unknown. The levy can be adjusted over time, but as a result of technical criteria or political considerations, rather than by the supply and demand of carbon allowances. A carbon levy inherently collects funds that can subsequently be disbursed, for instance towards R&D.

The number of carbon pricing schemes in place or currently being implemented across the globe is increasing, and by 1 April 2019 covered about 20% of global GHG emissions. From 2018 to 2019 (as of 1 April) there was an increase from 51 to 57 schemes. Of these, 28 were ETSs and 29 were carbon levies, with the latter often focusing on fossil fuels. While 46 of the carbon price initiatives are national or even local in scope, only a few are international [3].

Research and empirical evidence have shown that CO₂ pricing can be an effective emission reducing instrument, providing a positive incentive to invest in new carbon abatement or energy reduction technology. The Report of

the High-Level Commission on Carbon Prices concludes that a well-designed carbon price is an indispensable part of a strategy for reducing emissions in an efficient way [4].

However, the organizational design and level of carbon pricing varies widely among markets and sectors, leading to varying degrees of success. In a review of lessons-learned from CO₂ pricing in the petroleum sector (e.g. [5]), a common finding is how external factors affect emission levels. These factors include market changes, global oil prices, changes in energy systems and security of supply. Should CO₂ pricing be introduced to shipping, similar effects of external factors should be expected.

Few existing carbon pricing schemes are international in scope, which reflects the challenges of cross-border schemes. Shipping is uniquely placed to enact international legislation through the work of IMO, which is critical for a level playing field.

A scheme will have to address impact on states, the critical role of international shipping in global trade, and how it can be properly enforced, collected, and deployed.

Decarbonization technology for maritime applications is still in its infancy, challenged by cost and scalability issues [1]. Zero-carbon and carbon-neutral fuels such as sustainable biofuels, hydrogen and ammonia require significant R&D and large-scale changes to existing infrastructure (both shore-based and vessel-based) before they become significant contributors. Bridging technologies such as LNG, LPG and multi-fuel engine solutions can play a crucial role in easing this transition and ensuring that ships and infrastructure being constructed today remain viable as the decarbonization technology landscape evolves and matures.

We expect that carbon pricing will provide an incentive for transitioning to low/zero carbon alternatives. Given the long asset life of vessels, a clear trajectory on carbon pricing over the long-term should positively influence investment decisions

at an early stage. Hence, a carbon levy at a pre-determined level is preferable to a trading scheme where the price of carbon credits can be highly volatile, with a levy resulting in investment decisions being made under conditions of greater certainty and therefore more progress on decarbonization.

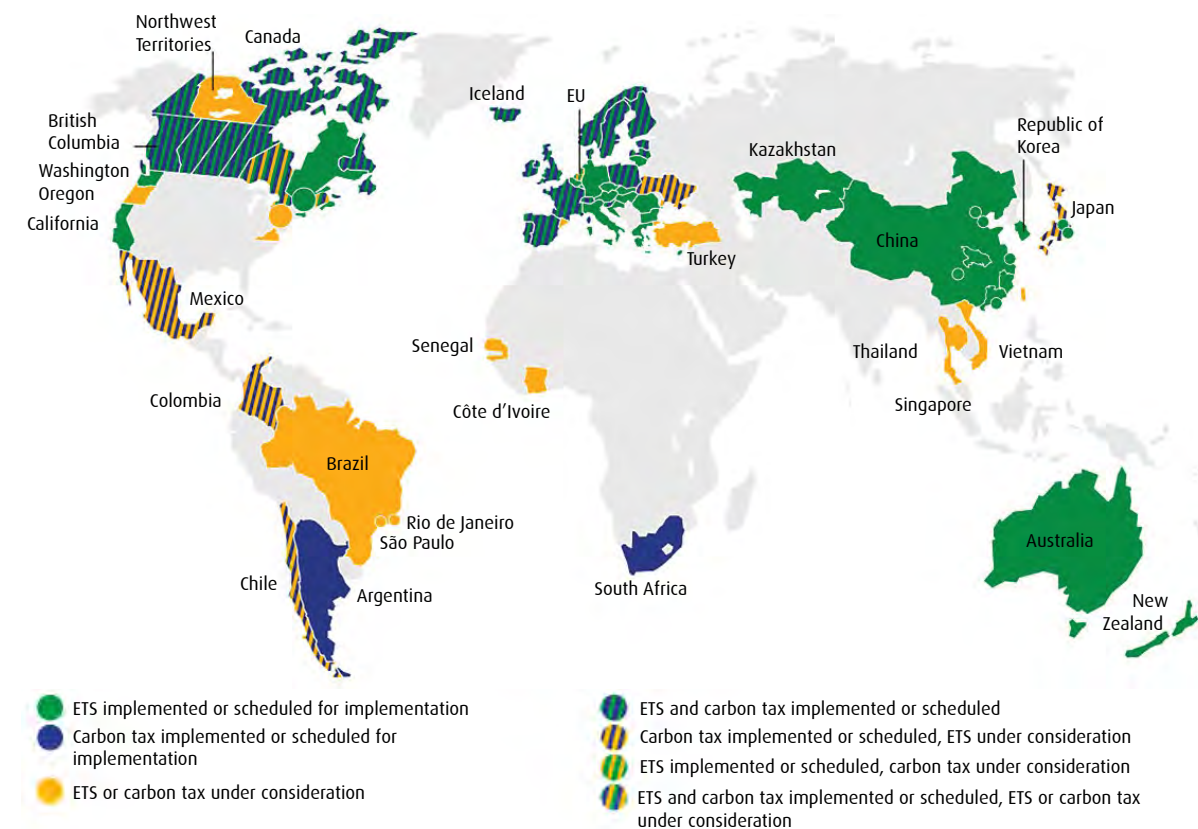
A carbon levy also has the advantage of collecting revenue that can be used to stimulate R&D and technology deployment. For example, an investment rebate mechanism has been applied with good results through the Norwegian NOx-fund to stimulate the uptake of abatement technology, and a similar approach could be envisaged for CO₂.

Conclusion: There is evidence that carbon pricing works. Schemes are in place in a growing number of countries, and many governments and industry leaders across different sectors have been on record to express the importance of carbon pricing as a means to incentivize CO₂ reduction.

A transparent carbon levy scheme, where a price is explicitly communicated and charged on CO₂ emissions, works best because limited carbon price volatility allows businesses to invest in abatement measures under conditions of greater certainty. Another advantage is that a relatively stable source of funding allows for research, development, piloting and scaling with some planning horizon.

In order to ensure that the overall emissions trajectory is taken into account, while still giving a good level of price certainty, the scheme could set a clear price path for the initial periods followed by a review thereafter.

Status overview of regional, national and subnational carbon pricing initiatives



Source: World Bank [3]



How Should the Price on Carbon Be Determined?

There are many different points of view on what the price should be, also within the working group behind this paper. We believe that one of the key considerations in light of the Paris Agreement and the global aspirations it represents, as well as the ambitions set in IMO's GHG strategy, is that a carbon price needs to be set at a level that incentivizes real GHG emission reduction efforts through technological and/or operational solutions. The carbon price should send a clear signal to industry stakeholders to start investing in decarbonization, but it should also not disrupt trade or have a disproportionate impact on states.

We have looked at appropriate price levels needed to cover the costs of:

- Funding of R&D, pilot projects and initial scaling
- Reducing or levelizing the additional cost of alternative fuels

Additionally, to ensure that the price is set at the right level, we have also considered:

- Targets set by the Paris Agreement, and related price levels
- Levels applied to other industries
- Cost impact on consumers and GDP

Funding of R&D, pilot projects and initial scaling-up

R&D and piloting costs per installation are expected to be high initially, but with a limited number of installations, the total cost is not very high. The funds could cover research into carbon neutral or zero carbon fuels and support scaling initiatives and initial infrastructure development.

For example, a levy of USD 10/ tCO₂ (corresponding to a levy of USD 30/ t fuel) could give annual proceeds of

USD8 billion assuming an emission level of 800 million tonnes CO₂ [1]. In a scale-up phase and to support infrastructure development, a higher levy may be needed.

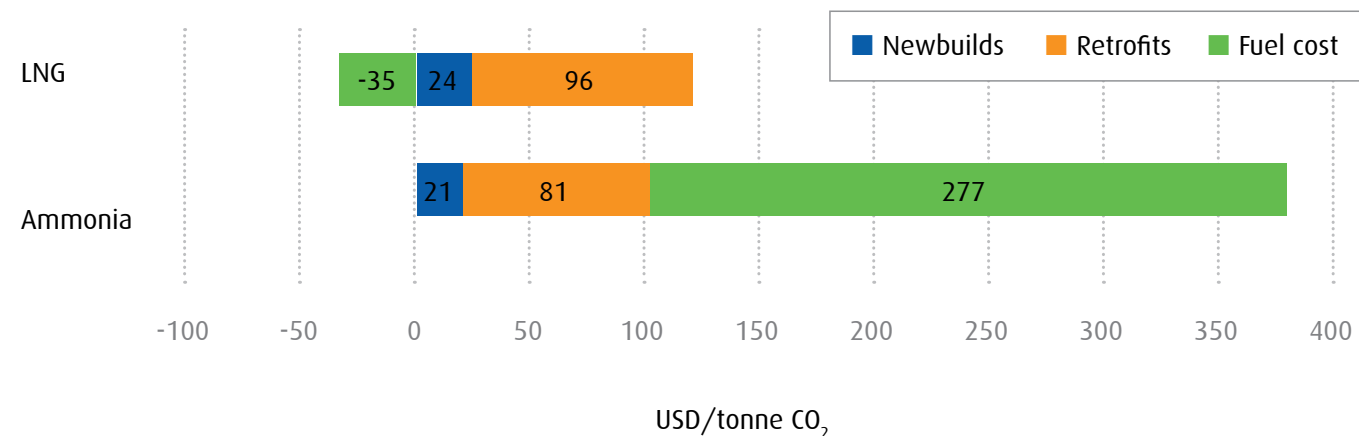
Levelizing the cost of alternative fuels

At some stage, alternative fuel systems will be commercially available, but yards, designers and manufacturers still need to learn how to implement and improve the designs and systems. Over time and with scaling, the cost will go down. Similar learning and scaling effects are expected for the fuel infrastructure and distribution costs.

Comparing total annual investment costs with additional costs for zero carbon fuels, it is expected that the cost of the fuels itself will significantly exceed the investment in onboard systems. The uncertainty of future engine, storage and fuel costs is high, but our analysis indicates that at current price levels the levy may have to be more than USD 400/ tCO₂ to cover the true transition costs from LSFO/MGO to for instance ammonia.

Offsetting only the onboard additional capital expenses though rebates or investment support will not have a significant impact if the operational expenses are so much higher. The onboard capital expenses for converting to ammonia are not expected to be higher than for converting to LNG or LPG. With prices trending lower than MGO – as is currently the case for LNG and LPG but not for ammonia and other zero-carbon or carbon-neutral fuels – we believe that the industry can afford to take on additional investments in onboard systems and onshore fuel distribution infrastructure with the prospect of benefitting later from lower fuel costs.

Additional costs per tonne CO₂ compared to LSFO/MGO



Targets set by the Paris Agreement and levels applied to other industries

The Report of the High-Level Commission on Carbon Prices concludes, "the explicit carbon-price level consistent with achieving the Paris temperature target is at least USD 40-80/ tCO₂ by 2020 and USD 50-100/ tCO₂ by 2030, provided a supportive policy environment is in place". While we acknowledge that this is an economy wide carbon price target and not one specifically set to decarbonise shipping, we think that it remains a relevant benchmark.

A carbon price for shipping should not be far from the price range for other industries. The major cost element – the cost of a zero-carbon or carbon-neutral fuel – is also closely linked to energy costs in other sectors. We believe it is unlikely that shipping would need a much higher carbon price than other sectors to incentivize the necessary changes.

As of 1 April 2019, about 20% of global GHG emissions were covered by a carbon price, of which only 5% were priced at levels consistent with the goals of the Paris Agreement i.e. USD 40-80/ tCO₂. The carbon price range was USD 1-127/ tCO₂, and typically around USD 5-30/ tCO₂ [3, 4].

Cost impact on consumers and GDP

Shipping is a facilitator of trade and increasing costs can impact consumers and economic growth. In a study published by the IMF, a levy of USD 75/ tCO₂ in 2030 could increase shipping cost by 0.075% of global GDP [6]. For the consumer, if looking at the shipping cost component only, the impact of a levy at this level would be negligible. If a carbon levy is introduced for fossil fuels world-wide, the impact would be more substantial. IMF has calculated that gasoline prices would then rise by 5-15% with carbon levy at USD 75/ tCO₂ [7].

This analysis notwithstanding, some vulnerable economies such as Small Island Developing States (SIDS) with long distances to markets, as well as Least Developed Countries (LDC), may be impacted. The benefit of reduced emissions therefore has to be measured against the impact on the citizens of these nations.

In terms of the impact on industry, fuel costs over the past decade have fluctuated between USD 200-600/ tonne HFO, which is far more than the contemplated levies. This suggests that the industry is well able to absorb these costs. The main considerations should be towards creating a level playing field and introducing a steady increase that gives both visibility and time to adjust to higher prices.

Conclusion: We believe that a carbon pricing scheme for shipping should initially provide sufficient funds for R&D, piloting and initial scaling with regards to onboard ship systems, and for alternative fuels and onshore infrastructure. The price should aim to be in line with the price range for other industries.

Well before 2035, a review should determine the levy needed for Stage 3. This stage would be conducted with a view to incentivise full decarbonization of shipping, while taking into account the progress on technologies and alternative fuels by that time, and broader progress on climate change. The following staged approach concept is envisaged - with price escalation within each stage:

Stage	Use of Proceeds	Level (per tCO ₂)	Annual Proceeds ¹
Stage 1: Short term (Until 2030)	R&D and piloting	USD 5-30	USD 4-24 billion
Stage 2: Mid-term (2030 - 2035)	Further piloting, initial scale-up and infrastructure	USD 10-50	USD 8-40 billion
Review and determine levels for Stage 3			
Stage 3: Long Term (From 2035)	Towards full scale-up and transition	Level TBD	TBD, but total volume may decrease as decarbonization accelerates

¹ Assuming 800 million tonnes CO₂ emitted annually

How Should the Proceeds be Collected and Enforced?

There are, broadly speaking, two different ways to handle the collection and administration of proceeds from a carbon levy.

Collection by an international (shipping) body: This could, for example, be similar to the International Oil Pollution Compensation Funds (IOPC)² which operates under the IMO's auspices to provide compensation for oil pollution damage. Ships would be obliged to pay annually based on their fuel bunkering documentation or verified fuel oil consumption reports as reported under the IMO Data Collection System (DCS).

Collection of funds by an international body would likely require additional administrative resources. We have indicated annual proceeds between USD 4-16 billion for Stages 1 and 2. For comparison, the IOPC Funds' cash assets were about £99 million in 2017 [8].

Bunker suppliers and/or national governments

would be an alternative collection method, ideally on behalf of an international fund. Many countries (although not many major Flag States) already collect a CO₂ tax on fuels as part of their national taxation schemes. A shipping carbon levy could build on this system by applying an internationally agreed levy on the ship at the point of bunkering. For countries with insufficiently robust legal mechanisms it could be a challenge to ensure compliance and full flow of proceeds to the international fund. A small portion of the levy could be directed towards collection/enforcement to ensure alignment of interests.

Documentation and enforcement mechanisms are critical to making a carbon levy work in practice and to avoid non-compliance. We consider that utilizing existing IMO legal instruments and established mechanisms would be appropriate as they are well known in the industry and have been proven to work. We envisage Bunker Delivery Notes and the fuel consumption data reported through the IMO DCS to be the core components of any system. It is worth noting that this may lead to a need to strengthen the verification element of the DCS as the practical implementation of verification is left to the discretion of the individual Flag State. Upon verification of correct payment, a certificate would be issued by the Flag State, and port state control would be able to inspect this document as for other certificates, and enforce accordingly.

Conclusion: We believe that proceeds should be collected by a supranational entity such as the IMO. The enforcement should be modelled after well-known shipping conventions such as MARPOL and be linked to the verified fuel consumption from the Data Collection System (DCS). This will ensure that the shipping sector has control over the proceeds, and a level playing field is established for enforcement and collection.

How Should the Proceeds be Deployed?

In order to deploy funds in an accountable manner, whether within or outside the shipping industry, an organization should be established under the aegis of IMO and in line with best practice for charitable foundations. This entity would require an independent CEO and management team reporting to a board of trustees, with clear objectives and reporting frameworks. The board of trustees could include a combination of stakeholders, including shipping industry figures and independent experts on environmental technologies.

Proceeds from a carbon levy could be deployed either in shipping or outside the sector.

Within the shipping sector, ship and fuel technology will require fundamental transformations for the 2050 targets to be achievable, not to mention for the ambition of full decarbonization. Significant funds are needed for research, trials, implementation and scaling, the latter to ensure that cost to the buyer is reduced over time.

Any proceeds beyond what is needed to support research and development could be used within the sector to incentivize technology uptake. An option in support of scaling can be to incentivize operational improvements through a rebate mechanism to ship owners. There are a multitude of possibilities for how this could be done, from a fixed rebate sum for each unit of abatement achieved³, to rebates based on calculated or measured CO₂ emissions relative to a benchmark. Recycling funds back to shipping through rebates on documented reductions and investments would be challenging to scale for global applicability, while a rebate based on documented emissions related to a ship type and size-specific benchmark⁴ would require simple and accepted measurement criteria to ensure enforceability.

Outside the shipping sector, we see two general approaches for deployment of funds.

First, the uptake of low carbon/carbon neutral fuels is dependent on availability, which implies development of new infrastructure and conversion of existing infrastructure. Part of the funds can be deployed to reduce the financial risks for suppliers of this infrastructure, which will support scaling.

Secondly, a non-shipping use of funds that has seen political interest is contribution to United Nations mechanisms such as the UNFCCC Green Climate Fund (GCF). The fund was created in 2010 and has a goal of collecting USD 100 billion per year for climate change adaptation and mitigation. Collection so far lags far behind ambition, and it has been suggested that shipping should contribute to the GCF if a shipping levy is established. Along the same lines, support of the UN Global Environment Facility (GEF) could also be an option.

³ An example is the Norwegian NOx Fund which has been highly successful in creating significant reductions in NOx emissions: <https://www.nho.no/samarbeid/nox-fondet/the-nox-fund/>

⁴ This could for example be the EEDI (Energy Efficiency Design Index) reference line.

² Assuming 800 million tonnes CO₂ emitted annually

Conclusion: We believe that the proceeds should primarily be redistributed back to the maritime sector to drive in-sector decarbonization. The funds should be managed by a professional foundation established for the purpose. The main purposes should be to fund R&D and trials, and support technology deployment and scaling. Any proceeds beyond that could go towards globally well-established environmental funds like the Global Environment Facility (GEF) and the Green Climate Fund (GCF).

Concluding Remarks

The maritime industry is looking to achieve the IMO 2050 ambition of 50% reduction in GHG emissions compared to 2008 levels and has a responsibility to work towards decarbonization. We believe that in addition to other measures, a carbon levy would be an effective enabler towards achieving this goal, if designed for a level playing field and providing: a predictable price over a period of time, proper enforcement and collection, and with proceeds deployed into research, development and scaling to achieve an effective transition for the industry.

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- [1] Smith, T., Jalkanen, J. P., Anderson, B., Corbett, J. J., Faber, J., Hanayama, S., ... Pandey, A. (2014). Third IMO GHG Study 2014: Executive Summary and Final Report.
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- [4] High-Level Commission on Carbon Prices (2017). Report of the High-Level Commission on Carbon Prices. World Bank, Washington DC. License: Creative Commons Attribution CC BY 3.0 IGO.
- [5] Gavenas and Tangen (2017): Does carbon pricing really work? : an empirical evaluation of CO₂ emissions on both the Norwegian Continental Shelf and the UK Continental Shelf.
- [6] Parry I, Heine D; Kizzier K, and Smith T (2018): Carbon Taxation for International Maritime Fuels: Assessing the Options, IMF Working paper, September 2018.
- [7] IMF (2019): Fiscal Monitor: How to Mitigate Climate Change, September 2019.
- [8] IOPC (2018): 2017 Financial Statements, International Oil Pollution Compensation Fund 1992, August 2018.



Around the World

1. **Extending a Hand of Friendship**

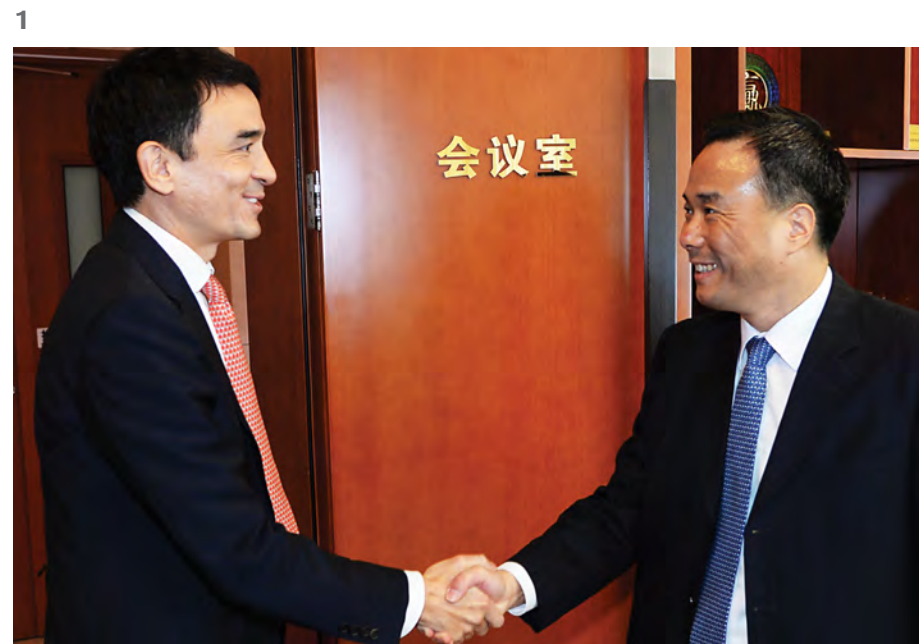
BW Group Chairman Andreas Sohmen-Pao visited Mr Ling Yiqun, Senior Vice President, Sinopec Group, in October in Beijing.

2. **Happy Retirement**

Kolbjørn Rødal retires after 40 years of exemplary service to BWFM. He joined his first vessel in BW on 7th Aug 1979 as 3rd Officer. He signed off his last vessel Berge Arzew as Onboard Trainer, on 20th September 2019. We thank Kolbjørn Rødal for his loyal service and we wish him all the best in his retirement.

3. **A Mock Arbitration**

Nick Fell, EVP (Corporate Services) and General Counsel of BW Group (second from right) was part of a panel of lawyers, mediators and arbitrators participating in a mock mediation and arbitration session in September at the Singapore Stock Exchange. Organized by the Singapore Chamber of Maritime Arbitration and the Singapore Academy of Law, the session highlighted how mediations and arbitrations actually work and served to demystify these dispute mechanisms which are very common in the shipping world



4. **ExxonMobil Powerplay Finalist**

Congratulations to Saran Soon (second from right) from BW LNG on making it to the finals in the prestigious PowerPlay Awards 2019! We are extremely proud of Sarah; both nominees and winners are all remarkable women paving the way for future outstanding female professionals.

5. **Welcoming Two Flowers to the Fleet**

In September, BW Pavilion Aranda (H2489) was named by Mrs. Mou Khum Chan, spouse of Mr Alan Chan (Deputy Chairman, Pavilion Energy). BW Magnolia (H2490) was named by Mrs. Helen Shepard, spouse of Mr. Jonty Shepard (Head of LNG, BP). Both vessels are on long-term charters.



6. **BW Offshore Beckons**
 BW Offshore participated in Bedriftsdagen 2019 at the Norwegian University of Science and Technology (NTNU) with a booth to showcase the opportunities in the offshore sector and with BW Offshore.

6



7. **Hafnia at the Table**
 Hafnia CEO Mikael Skov was a panel participant at the Maritime Cyprus 2019 Conference in October discussing the topic "Are there brighter days ahead for Shipping?" The panel concluded that shipping is in a game-changing era of transformation, with key drivers being decarbonisation and digitalisation. Hafnia, as a responsible shipowner, is committed to reducing the industry's impact on the environment.

7



8. **Sustainable Ship Recycling**
 Out-going BW LPG CEO Martin Ackermann took part in a roundtable in November on Responsible Ship Recycling Standards (RSRS), organized by ABN AMRO.

8



9.
Sharing Expertise

BW LPG EVP (Technical and Operations) Pontus Berg participated as a panel speaker at the AVEVA World Summit in September, where they discussed sustainability, regulatory changes, emerging business models, the challenges of the industry's aging workforce and the capability for autonomous ships in the future.

10.
Jumping for Joy

Jumping for joy at the start of another busy few months in Singapore for the BW LNG team - LNG FSRU BW Magna began her modification works in September at Sembcorp Marine Admiralty Yard in preparation for her 23-year contract in Brazil.



9



Special Thanks To . . .

25
Years

October

Arias Renie Zembrano, Motorman
Bernt Dalsbø, Electro Technical Officer
Viney Kanwar, GP Marine / Crane Operator

November

Bjørnar Harneshaug, Master
Cainglet Salustiano Jr. Cagas, Able Seaman
Patalagsa Rommel Valebia, Chief Engineer
Pelayo Roque Olasiman, Bosun
Tan Jamie Lao, Able Seaman

December

Bulsecu Ramon Elejorde, Motorman
Jarle Kristiansen, Offshore Installation Manager
Rolando Branzuela Ortaleza,
Maintenance Supervisor
Samson Arnold Arboladura, Cargo Engineer

45
Years

July

Stig Solheim, Technical Superintendent

35
Years

December

Arnt Thyge Nielsen, Electro Engineer

30
Years

July

Glemao Jose Carlo Cadungog, Chief Officer
Lunes Roberto Rosales, Able Seaman
Surian Nassal Uy, Chief Officer

October

Conda Elmer Jacob, Master

25
Years

July

Ole Solvåg, VP Operations Control
Philip Abrao Bernard, Safety Officer
Stepan Gukaliuk, Master

August

Abogadie Ronil Misa, Motorman
Terje Andersen, Chief Engineer

September

Ibanez Rodrigo Cequena, 2nd Engineer
Ole Raknes, Chief Engineer
Sarra Henry Dumas, Chief Steward Cook
Stian Kenneth Andersen, Master

20
Years

July

Jansen Gomez Sibal, Marine Superintendent
Jonny Edvin Torrisen, Chief Engineer
Levy Arayon Casibang, Production Operator
Pagdilao Randy Bautista, Chief Engineer

August

De La Pena Gilbert Besana, 2nd Engineer
Igor Nisnevich, Marine & Safety Superintendent
Remerata Dominic Maxilom, 2nd Engineer
Velez Domingo Jr. Quiniano, Bosun

September

Galido Franjie Gustilo, Engine Fitter

October

Fernandez Lacirus Mandin, Master
Kandathil Joseph Sajumon, Motorman
Mabaquiao Mark Anthony
Dalumpines, Chief Officer
Ramon Fermiza Dela Cruz, Utility Operator

November

Felipe Jr Togoto Leyson, Utility Operator
Jumamil Rafael Banocia, Able Seaman
Lopez Molie De La Victoria, Bosun
Pjotrs Koziks, Fitter
Urbano Allan Dela Cruz, Chief Officer

20
Years

December

Aleksejs Kulakovs, Chief Engineer
Dmello Joao Filipe, Able Seaman
Gujral Vishal, Chief Officer
Torleif Andersen, Chief Engineer

15
Years

July

Dias Socorriano, Cook
Francois Moussavou Dipanda, Steward
Ian Braastad, SVP Maintenance
& Modification Projects
Marek Rafal Dabrowski, Safety Officer
Nandikolla Kishore Kumar, Cook

August

Kalathingal Nishanth, Able Seaman
Ray Malana Batino, Bosun / Crane Operator
Whiffin Michael Andrew, Chief Officer
Wu Yuqing, Chief Officer

September

Glomo Dennis Tristeza, 2nd Officer

October

Cynthia Oh, Manager, Financial
Accounting & Analytics
Dakshinamoorthy Govindaraj, Fitter
Patham Satyen Mark, 2nd Officer
Pereira Rodolfo Piedade Francisco, Motorman
Sharon Tiong, Senior Manager,
Tax and Financial Projects
Surangalikal Saurabh Shashikant, 2nd Engineer

November

Alexander Sypchenko, Electrician
Daniel Digouanzi, Bosun
Patrick Mbina Mbina, Painter
Praveen Kumar Srivastava,
Production Superintendent

December

Denny Soedibjo, HC Manager Singapore
Ivan Popov, Senior Engineer Instrument & Control
Komara Eswara Rao, Able Seaman
Sameer Ramesh Parate, Medic

10
Years

July

Apolonio Jr Concepcion Olarte, E&I Supervisor
Carballo Benedict Vinas, 3rd Officer
Carlito Zanoria Yu, E&I Supervisor
Elias Caetano Da Silva, GP Marine
Emerson Luiz Costa, GP Marine
Ex Michael Raj, Able Seaman
Galvez Antonio Canong, Electro Technican
Gaspar Yuri Tagtag, 3rd Engineer
Laforteza Karl Bryan Mena, 2nd Engineer
Ligsay Lorenz Christopher Labrador, 2nd Engineer
Miller Dotdot Achas, Electrician
Murillo Zandro De Galicia, Motorman
Regi Antony Ronald Jones, Able Seaman
Srivastava Mohit, 3rd Officer
Sumit Pandey, Field Operator Marine
Varughese Abraham Puthusseri,
Control Room Operator

August

Acosta John Robin Lee Chavit, 3rd Engineer
Adonis Costanilla Catarina,
Bosun / Crane Operator
Aksel Uglehus, Offshore Installation Manager
Anderson Luiz Pimenta Pereira, Medic
Bitantos Jason Duhaylongsod, 2nd Officer
Chauhan Umesh, Fitter
Christopher Cacalda Bacsafra, Electrician
Erik-Jan Elzinga, Project Superintendent
Fernandes Cirilo Gaspar, Pump
Fernando Ballina Moreno, Mechanical Technician
Guy Roger Mbourou, Payroll Coordinator
Hakim Samir Kutubuddin, Fitter
Jesus Jr Magnaye Dapat, Fitter
Joel Brandao De Almeida, GP Marine
Karthikraja Murugesan, Fitter
Kotta Kunnummal Abeesh, Cook
Malgundkar Zuber, Fitter
Marlon Sarita, Control Room Operator
Muniyasamy Kamatchi, Control Room Operator
Nestor Dispo Mejorada, Production Operator
Purushothaman Pradeep, 2nd Officer
Sangolkar Dilip Premchand, 2nd Officer
Sherwin Rabe Blanquisco, Marine Operator
Sreenivas Nooka, Maintenance Superintendent

10
Years

September

Erwin Granil Domingo, Senior Instrument Technician
 Fernandes Gladstone Gabriel, 3rd Engineer
 Gopalakrishnan Hariharan, 3rd Engineer
 Hart Ambrose Ibifubara, Motorman
 Hirwani Pitambar, 2nd Officer
 Leonardo Leandro Marques De Siqueira, Production Operator
 Pawar Rohit Vasant, 2nd Officer
 Singh Brahma Murat, 2nd Officer

October

Arantxa Hernandez, Senior Fleet Purchaser
 Bains Gagan, 2nd Officer
 Chauhan Ashok Kumar, Fitter
 Dexter Asi Cueto, Instrument Technician
 Ijogho Kennedy, Able Seaman
 Marcio Barboza Nunes, Offshore Material Coordinator
 Oyovbaire Abel Ochuko, Able Seaman
 Philemon Kondi Babaka, Assistant Fitter
 Sehjal Tarun, 3rd Engineer
 Tandel Pramodkumar Kantibhai, Able Seaman
 Tizon Mark Villamor, Engine Fitter
 Upadhyay Manish, 2nd Officer
 Worgu Daddy Browb, Able Seaman

November

Abraham Samuel, 3rd Engineer
 Aliyu Musa Umar, Motorman
 Awazie Caleb Ndubuisi, Motorman
 Chouhan Arvind Kumar, Fitter
 Daniel Ugwum David, Able Seaman
 Egbuniwe Jerry Nwanye Obanye, Wiper
 Emmanuel Deacon Bitrus, 3rd Engineer
 Franck Koumba Do, Maintenance Tech / Engine
 Jelord Romeral Adonis, Production Operator
 Madhu Shyamala Sooraj, Cook
 Magaji Hussain, Motorman
 Marcu Monday John, 4th Engineer
 Musa James, 2nd Cook
 Onwe Okwor Emeka, 2nd Cook
 Oseni Babatunde Oseni, 3rd Officer
 Rafael Costa Da Camara, Production Supervisor
 Singh Mopinder, Chief Officer

10
Years

Umesi Chero Prince, Motorman
 Wuche Benjamin Chimchezum, Cadet

December

Adamudo Adole, Cadet
 Behram Gustasp Sethna, Marine Operator
 Clemente Sebastiao, Cook
 Kirk Barlass, SVP Operations
 Mailat Mahesh, Bosun
 Mudiakal Madhusoodhanan, Cook
 Rodolfo Malana Podutan, Marine Operator

Retired

Bernt Dalsbø, Electro Technical Officer
 Fadra Mohamed Siddique, Able Seaman
 Faustino Gonzales Pellitero, Chief Engineer
 Hans Willy Simensen, Marine Superintendent
 Kolbjørn Rødal, ONBT/Master
 Rosalinda Cruz, President, BW Shipping Philippines
 Singh Laxman, Cook
 Stig Olav Sivertsen, Master
 Tom Tollefsen, Production Superintendent



H E R I T A G E

Dr Sohmen viewing the renovated headquarters of Germanischer Lloyd
with Dr Hans Payer, a Member of the Management Board
in September 2000. Dr Sohmen spoke at the opening ceremony on
“The Role of the Classification Societies from the Perspective of an Owner”

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