April 2021

MARITIME REPORTER AND ENGINEERING NEWS

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WINDS OF CHANGE

INSIDE THE RED-HOT OFFSHORE WIND MARKET

Since 1939

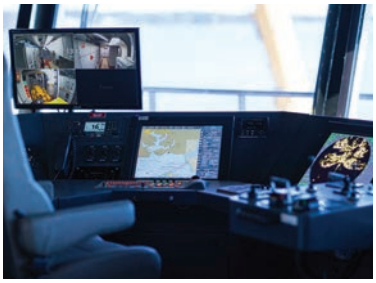
Number 4 Volume 83

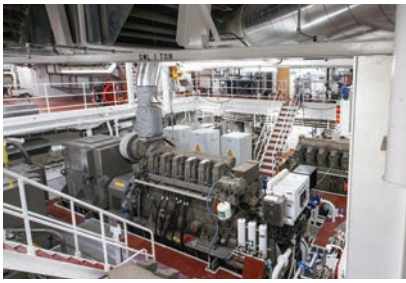
MARKET REPORT
2021: THE YEAR WHEN U.S. OFFSHORE WIND TAKES OFF

INTERVIEW
JEFF ANDREINI, VP, NEW ENERGY DIVISION, CROWLEY

KNUT ØRBECK-NILSSEN ADVISES
AS MARITIME TRANSFORMS, "MIND THE (SAFETY) GAP"

Renewing U.S. Waterways





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OHT's Alfa Lift is floated-out at CMHI's shipyard in Jiangsu, China.
Photo Source: OHT

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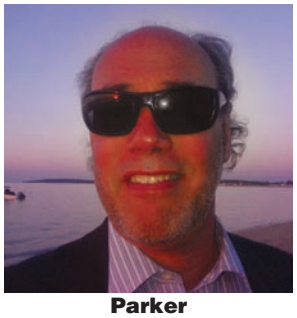

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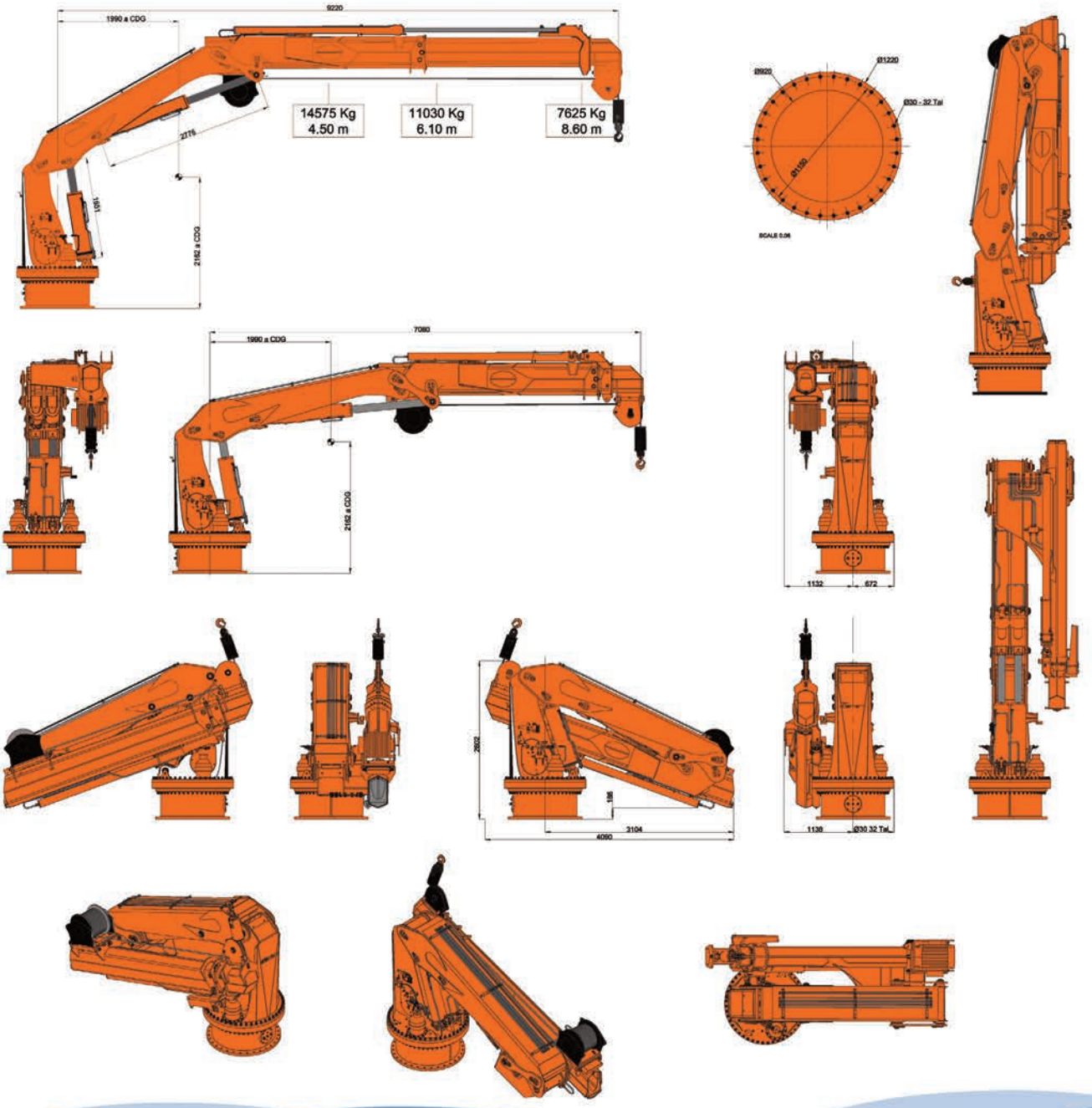

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Trying to put the pace of growth in the U.S. offshore wind market in perspective is challenging, simply because I haven't seen anything like this in the past 30 years. There was a steady march forward – with ample starts, stops and stumbles – for the past 12 to 36 months, but since the start of 2021 there has been a tidal wave of activity in and around U.S. offshore wind, particularly in our backyard on the U.S. Northeast coast, a surge which promises to simultaneously buoy offshore energy, maritime, subsea, port and logistics businesses for a generation or more to come.

We cover the industry and its cumulative potential impact like no other, across all of our media properties serving these five distinct but closely interconnected market sectors. While the prospects are bright, this is not to say there are not numerous challenges ahead, particularly in regards to regulatory approvals and the continuing struggles on all industries due to the lingering COVID-19. But looking out the portal today it appears that the stars are aligned for a nice, long market run.

In addition to our titles, print and electronic, **Phil Lewis**, Director of Research at our World Energy Reports, has become the de facto 'go to' for to get scope and scale to the opportunity before us. Lewis has anchored a number of our offshore wind webinars, and has authored a number of recent reports on the subject – including *2021: The Year When Offshore Wind Takes Off in the United States* – a report which is excerpted starting on page 30 of this, our 'Offshore Wind' edition.

The story presents insights on the cumulative potential financial impact, including an estimated $87.5B annual CAPEX and $2.8B annual OPEX.

The offshore wind coverage in this edition is voluminous and spread throughout, including **Barry Parker**'s look insight some of the major vessel operators (p. 24); **Joan Bondareff**'s look inside the legislative drivers for the U.S. market moving forward (p. 14); and my interviews with **Jeff Andreini**, VP, New Energy Division of Crowley regarding his company's recent joint venture with Esvagt (p. 40), and with **Josh Diedrich**, Managing Director of WindServe Marine regarding the construction of and power package onboard the new WindServe Odyssey (p. 40).

Gregory R. Trauthwein
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Offshore Wind Vessel Construction, Ownership

Offshore Wind is '*the*' story of 2021 with is promise to lift shipbuilding, equipment supply, ports and logistics. **For a full Offshore Wind Market report, turn to p.30.**

Top Windfarm Builder Countries

Country	# of Vessels
China	27
Norway	12
Spain	7
South Korea	6
Netherlands	6

Top Windfarm Vessel Builders

Company	# of Vessels
Havyard Leirvik	6
Cemre Shipyard	5
Ulstein Verft	5
Ast Gondan	4
Guangzhou Huangpu	4
Samsung	3
Crist	3
COSCO Qidong Offshore	3
China Merchant Heavy Ind	3
Lamprell	3

Top Windfarm Owner Countries

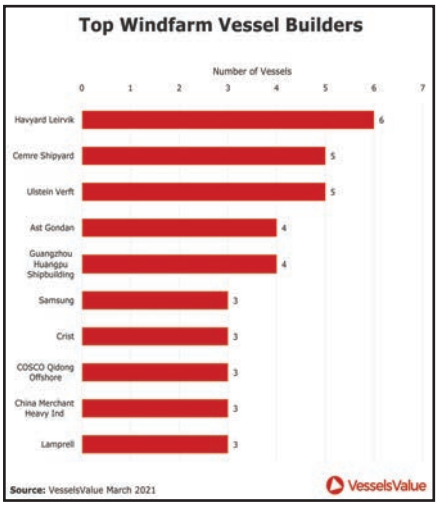
Country	# of Vessels
Denmark	15
China	15
Norway	12
Netherlands	9
Germany	7

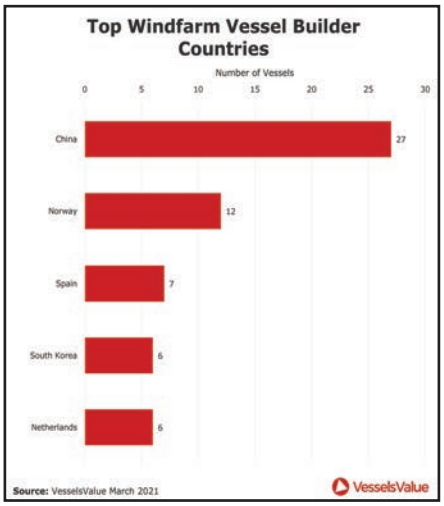
Top Windfarm Vessel Owners

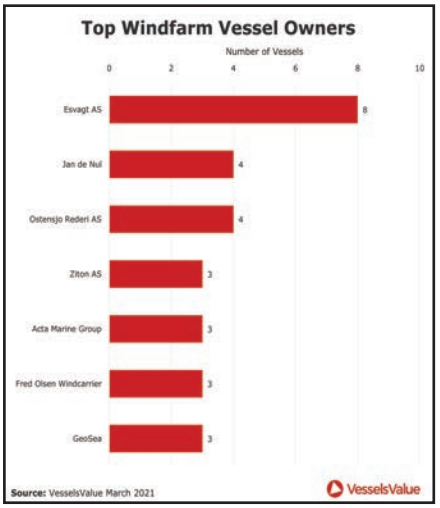
Company	# of Vessels
Esvagt AS	8
Jan de Nul	4
Ostensjo Rederi AS	4
Ziton AS	3
Acta Marine Group	3
Fred Olsen Windcarrier	3
GeoSea	3

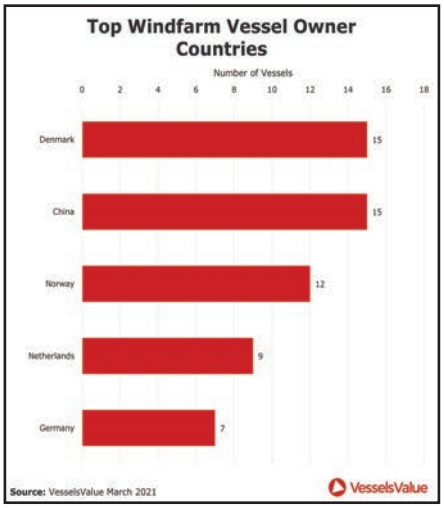
Windfarm Vessel Operating Region

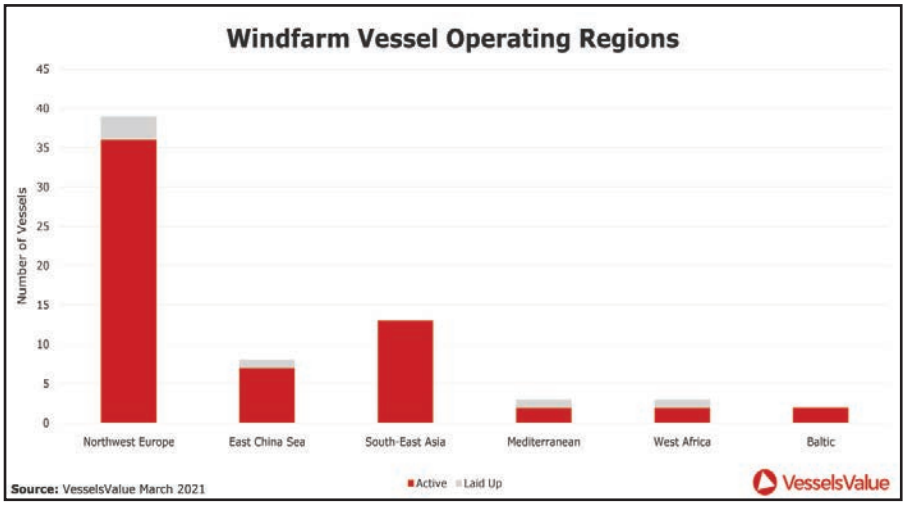
Region	Active	Laid Up	Total
NW Europe	36	3	39
E China Sea	7	1	8
SE Asia	13	-	13
Mediterranean	2	1	3
West Africa	2	1	3
Baltic	2	-	2
Grand Total	**62**	**6**	**68**











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Maritime Global News	24,215
Maritime Jobs	43,515
Maritime Logistics Professional	28,858
Maritime Propulsion	20,767
Maritime Reporter & Engineering News	59,804
World Energy News	45,916

The MarTID Survey

"The Maritime Training Insight Database, fills a void that's been in existence for quite some time. There's no real context within which you have this kind of data where we are trying to collect the insights from those diverse stakeholders."

Michael Manuel, Professor, World Maritime University

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"A Disgrace" *is how* **Knut Ørbeck-Nilssen, CEO, DNV - Maritime** *describes the continued global seafarer crisis. "It must be the heads of state for nations to take charge, show leadership, and assign seafarers as key workers."*

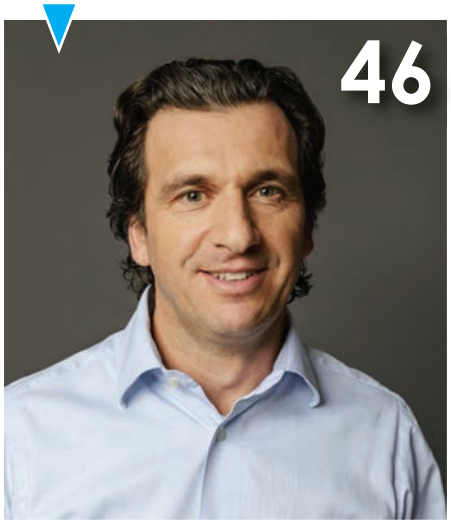
"Since the Biden Administration has taken over it's been like a tidal wave of information and requests that have come out over the last 50 days. And I anticipate that's going to continue in earnest over the next at least two years, if not longer."

Jeff Andreini, VP, New Energy Division, Crowley

Schulte Marine Concepts

"COVID has had no adverse effects on the shipbuilding capacity here in Asia."
Krzysztof Kozdron, Managing Director, Schulte Marine Concepts (SMC)

Autonomy
"What is required to deliver a fully autonomous vessel is hugely complex. When you look at the existing fleet in maritime, you're looking in technology in an order of magnitude that is almost incomprehensible to the technology we have on vessels today."
Sean Fernback, President, Wärtsilä Voyage



Tip #23

Is Your Training Tech Disaster-Ready?

A customer once told me that they had just completed a business continuity analysis and had identified their LMS as their second most mission-critical technology - second only to payroll! Take a moment to consider how much you rely on training technologies to sustain your operations and compliance. How long could you comfortably go without your employees having access to training? How long could you go without access to your compliance records or your employees' certificates? Since training (and proof of training) is required for compliance and safe operations, the answer is typically "not long". It is time that we all realize our training infrastructure is mission-critical, and that we treat it as such.

Mission-critical systems require special consideration in any business. Most importantly, there must be a well-designed, vetted and regularly tested disaster recovery plan (DRP). When an IT disaster strikes, so begins the unforgiving, and often harsh, test of an organization's DRP policies. And it will happen. Just a few weeks ago, on March 9, 2021, a fire broke out at Europe's largest cloud provider in Strasbourg, France. The damage was catastrophic. This impacted 3.5 million websites and applications across the world including government agencies, banks, online retailers, news websites and a good portion of France's .FR domain. It also impacted MarineLMS for some of our European customers. At that moment, the Marine Learning Systems DRP was, indeed, tested. Fortunately, we were ready. Are you?

In creating and maintaining a DRP, there is much to consider. Much more than can be included here. However, now is a great time to reconsider your own DRP, or to create a DRP for your mission-critical learning systems (and other technical systems). Let's identify the basics.

The first step is to create a full list of your mission-critical technology-based systems. What technologies do you rely on? Order them by how long you could live without them.

Next, consider the cost of the permanent loss of all LMS

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training records or the data in your other systems. Preventing data loss in the event of a disaster is the most fundamental requirement. For this, backups are your friend. Do you have them? How often are they taken? Are they immediately transferred off-site to a secure location? Guidelines vary according to the size, value, velocity, and complexity of the data, but generally backups should be very frequent - as often as every 15 minutes. Also, they should immediately be moved off site to a location that is physically distant from the live data. To do this efficiently, there are software tools created for exactly this purpose.

Next - while backups prevent data loss, they don't ensure that systems are restored quickly. If your LMS datacenter had a fire, what is the process for restoration at another datacenter, and how long would it take? Remember, in the event of a significant catastrophe, there will be sudden competition for new datacenter space, so finding a replacement may be impossible. Redundancy costs money, but it's the only reliable remedy in the face of a significant event.

Finally, how often do you test your DRP processes? This is not the kind of plan that can be written, implemented, and then shelved. That effectively guarantees that it will fail when you need it most. These plans need to be fully tested at least monthly.

What about the systems you rely on that are managed by your vendors? The principles are all the same as for your own systems. Do THEY do all of the above? How do they prove it to you? Do you have direct access to vet that the backups exist, are in a safe location, and are accessible? Do they maintain redundant systems at a different location and have a process for failover in the event it is needed? Can that process be demonstrated to you, using your data? This is important enough that it is a business' responsibility to not only trust, but verify. Contractual promises are great, but not sufficient.

In next month's Training Tips for Ships I will share some elements of our DRP processes to shed more light on this topic. Until then, sail safely!

The Author

Goldberg

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Favorable Offshore Winds

As part of his Executive Order on Tackling the Climate Crisis at Home and Abroad (EO 14008)—issued on the first day he took office—President Biden made significant commitments to renewable energy. The goal is to have net-zero GHG emissions by 2050.

By Joan M. Bondareff, Blank Rome LLP

Former Secretary of State John Kerry was appointed as the international climate envoy, and former Environmental Protection Agency (EPA) Administrator Gina McCarthy was designated as the domestic climate czar. They have their work cut out for them, as the goal of simply meeting the present Paris Climate Agreement goals may not reduce GHG emissions to the required levels.

Offshore wind will be a critical part of reaching the new domestic and international climate goals. President Biden recognizes this fact in the EO by promising to double offshore wind by 2030. Developers also recognize the connection by touting reductions in GHG emissions with each project. Right now, the United States is poised to have 30GW of offshore wind by 2030. From a simplistic point of view, doubling the present total means 60GW of offshore wind. But playing the numbers game for this goal is too simplistic. For the United States to realistically build 60GW of offshore wind, the states, private sector, and federal government must work together to take the necessary steps to meet and exceed this extraordinary commitment. A first step was taken with the issuance of the final Environmental Impact Statement (EIS) for the Vineyard Wind Project, discussed below. **See bit.ly/3frFrea**

This article addresses what role the maritime industry can play in this vital new offshore wind industry.

Vineyard Wind Receives Final EIS Approval, BOEM Permitting Restarted

The first step that the Biden administration made to double offshore wind was to restart the National Environmental Policy Act (NEPA) process for the mega-offshore wind project known as Vineyard Wind, located off the coast of Martha's Vineyard, MA, and expected to produce 800 MW of offshore wind and provide clean energy to 400,000 homes and businesses once it is operational in 2023. Vineyard Wind has committed to using the Port of New Bedford, MA, as its staging area. On March 8, 2021, the Bureau of Ocean Energy Management (BOEM) in the Department of the Interior issued the final EIS for Vineyard Wind, endorsing the preferred alternative of an east-west, north-south configuration of no more than 84 wind turbines with one nautical mile spacing between the wind platforms, which is consistent with the Coast Guard's recommendations. (See Vineyard Wind 1 Offshore Wind Energy Project Final EIS.). A final permit is expected to follow shortly thereafter.

This is a critical step because it not only restarts a project that the prior administration delayed for too long, but it will also break the logjam for other pending projects by signaling the Biden administration's support for offshore wind. At present, BOEM has approved 10 Site Assessment Plans (SAPs) and has 10 Construction and Operations Plans (COPs) under review—with more anticipated.

Another major project pending with BOEM is the Coastal Virginia Offshore Wind (CVOW) project developed by Dominion Virginia Energy. This project will include 188 Siemens Gamesa turbines and will supply 2.6 GW of clean energy to 800,000 Virginia homes and businesses when fully operational in 2026. The commercial CVOW project follows on the two-turbine 12 MW research project—also called CVOW—that is the first offshore wind farm to become operational in federal waters in 2020. (Deepwater Wind off Block Island, RI, is the first in state waters.) Dominion has also established a consortium to build the first Jones Act-compliant turbine installation vessel (TIV), called "Charybdis," currently under construction in the Keppel Yard in Brownsville, TX.

Role of the States and the Public

The states along the Eastern Seaboard have played a critical role in promoting offshore wind. After all, the wind on the outer continental shelf (OCS) must come ashore to stateside power stations and integrated with the electric grid. The price of offshore wind is coming down and becoming more competitive with natural gas through a combination of executive orders and state legislation.

For example, Governor Gina Raimondo of Rhode Island, now the Secretary of Commerce, set a goal of meeting its electricity demand with 100% renewables by 2030. Governor Phil Murphy of New Jersey set a target of 7500 MW of offshore wind by 2035. The Commonwealth of Virginia passed the Clean Economy Act in 2020, which called for zero carbon emissions by 2050 with 5200 MW of offshore wind by 2034. Absent state and public demand for clean energy, there likely would be little to no offshore wind industry in the United States.

Port Infrastructure, Worker Training & New Vessels

Many states have invested in new port infrastructure and new training programs for offshore wind workers. For example, Massachusetts was able to persuade three offshore wind developers to use its New Bedford Marine Commerce Terminal for the staging, deployment, and assembly of offshore wind components. (See *Massachusetts Offshore Wind Ports & Infrastructure Assessment* **bit.ly/2Q4nSpO**) The Virginia Port Authority has leased 40 acres to Ørsted to stage equipment at its Portsmouth Marine Terminal, which will become the southeast offshore chain hub with almost 300 acres available for wind development. (See Port of Virginia leases 40 acres to offshore wind company at Portsmouth terminal.) And Siemens Gamesa could construct a turbine facility at the same port. From a worker-training perspective, most workers will be expected to receive a Global World Organization certificate in order to work in this challenging new environment. A wind turbine alone can be 260 meters high, as in the case of the new GE Haliade-X 14 MW turbine. (See World's Most Powerful Offshore Wind Platform: Haliade-X.) Consequently, safety considerations will need to be paramount. States like Maryland and New York have awarded grants for worker training, and Virginia has established the Mid Atlantic Wind Training Alliance, which is a consortium of colleges and training centers that have created a critical workforce pipeline of highly skilled technicians. The early results of this consortium are very positive. But even with these programs, there is a lack of qualified U.S. mariners to crew all the new vessels. (See *Offshore Wind Energy: Planned Projects May Lead to Construction of New Vessels in the U.S., but Industry Has Made Few Decisions amid Uncertainties* **bit.ly/31WnuMZ**).

At the same time, developers are commissioning new offshore vessels, including crew transfer vessels and offshore support vessels. For example, Ørsted entered into a long-term charter arrangement with Edison Chouest Offshore (ECO) to build a Jones Act service operations vessel, which will be built in ECO's yards in FL, MS, and LA, and used in Ørsted's Revolution Wind, South Fork Wind, and Sunrise Wind projects off the northeast coast. (See *Ørsted and Eversource Charter First-Ever Jones Act SOV* **bit.ly/2Q6mKSx**) Larger TIVs are on the horizon, as noted in the Dominion "Charybdis" example above.

A recent report from the American Bureau of Shipping found that "demand for wind farm support vessels in the U.S. is expected to increase to support planned construction projects for both fixed and floating offshore wind farms in U.S. waters." This will be done through a combination of Jones Act and foreign-flag vessels. See *ABS Offshore Wind Report* **bit.ly/3wIBc4n**

Streamlining the NEPA and Permitting Process

Another element that will be critical to meeting and even exceeding the Biden goal of doubling offshore wind will be budget and staffing support for the agency that auctions leases on the OCS and approves SAPs and COPs. The former administration tried to streamline the NEPA and permitting process through new regulations and EOs. At the end of the day, it was not successful. The new Biden administration can learn from these attempts and undertake a new process for streamlining the review process without giving short shrift to climate and environmental justice—two of its principal goals –a challenge.

Role of the Maritime Industry

The maritime industry has a key role to play in this burgeoning offshore wind industry. After all, most of the operations take place in the marine environment. The maritime industry can notably work with major developers and become contractors and subcontractors; encourage developers and shipyards to work together on new and needed crew transfer, supply, and support vessels; advocate for a streamlined title XI loan guarantee program devoted to OSW vessels; develop training programs for workers who may be losing jobs in the coal industry and want to transition to the new, clean economy; set up shops and production facilities in the newly designated ports for offshore wind; and apply its relevant expertise and experience from the oil and gas industry. All of this is needed to achieve the Biden goal for offshore wind and meeting the Paris Accords.

By setting an ambitious goal, the Biden administration, working with the states, private sector, and federal government, can double the amount of offshore wind by 2030—and even exceed it. This presents many new opportunities for the maritime industry, both at sea and onshore in shipyards and ports.

Gulf of Guinea Approach

Incidents of piracy and attacks on merchant vessels in waters of the Gulf of Guinea are endemic. There are multiple factors at play, including but not limited to: poverty, limited government presence in coastal communities, minimal maritime law enforcement capability among coastal states, and corruption.

Incidents of piracy and attacks on merchant vessels in waters of the Gulf of Guinea are endemic. There are multiple factors at play, including but not limited to: poverty, limited government presence in coastal communities, minimal maritime law enforcement capability among coastal states, and corruption. Some foreign nations, primarily European, conduct patrols outside the 12 nautical mile territorial seas, but far too few to make a significant dent in the problem, and with no authority to operate closer to shore, where most of the attacks occur or where the attackers flee upon law enforcement arrival.

The Gulf of Guinea coastal states jealousy cling to their sovereignty but are unable to effectively address the problem. Cooperation among the coastal states has proven ineffective. For a variety of reasons, the coastal states have not devoted sufficient resources to address the problem.

Various proposals have been suggested for addressing this problem. All have failed for different reasons. I humbly recommend a comprehensive approach.

A United Nations-administered fund should be established to pay for resources, personnel, and training to maritime law enforcement agencies in each of the Gulf of Guinea coastal states. In exchange, those coastal states should authorize foreign nations to enforce coastal state law against violators operating in coastal state waters and to pursue pirates into the territorial seas for acts perpetrated on the high seas.

States with ships operating in waters of the Gulf of Guinea would be motivated to contribute to such a fund, as would

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owners and operators of ships engaged in such operations. Additionally, oil and gas companies involved in offshore activities and companies involved in imports and exports through ports along the Gulf would be incentivized to participate.

Maritime law enforcement personnel in the coastal states must be recruited in sufficient numbers to deal with this problem. They must be well-trained and paid a living wage.

These personnel must be properly equipped. They must have uniforms, side-arms, and long guns. Some of their vessels must be capable of operating throughout the exclusive economic zone (EEZ). The vessels should be fitted with weapons deter and apprehend pirates and armed criminals and outfitted for towing and other maritime operations. There must be proper shoreside bases for refueling and maintaining the vessels as well as the housing and training of personnel.

The legal code of each of the coastal states must be examined to ensure that the crimes of piracy, maritime robbery, murder, assault, kidnapping, ransom, and related offenses are properly defined. There must be criminal investigators, prosecutors, and judges to properly process alleged offenders.

Cooperation among the coastal states should be encouraged so that suspects of maritime crimes in the waters of one coastal state would be subject to arrest in another state and then either prosecuted by the arresting state or extradited to the state where the offense occurred.

Foreign (non-coastal) states that conduct law enforcement patrols on the high seas of the Gulf of Guinea and coastal state law enforcement agencies should cooperate in efforts to deter piracy and maritime robbery and related crimes. Foreign states should be authorized by the coastal states to engage in legitimate hot pursuit of perpetrators into territorial waters. Their personnel should also be authorized to enforce coastal state laws against piracy and maritime crime within the territorial seas of the coastal states, with apprehended individuals turned over to coastal state authorities for appropriate action.

The above is a bare bones outline of the elements of an approach that I believe are most important in order to deter the current epidemic of piracy and maritime crime in waters of the Gulf of Guinea. The effort will require time, money, hard work, and dedication for all those involved. History has shown, though, that the best way long-term way to address such criminal activity is to rebuild the economies and civil societies in the coastal areas.

The Author

Bryant

Dennis L. Bryant is with Bryant's Maritime Consulting, a regular contributor to *Maritime Reporter & Engineering News.*

MAN ES' new LNG Dual-Fuel Engine

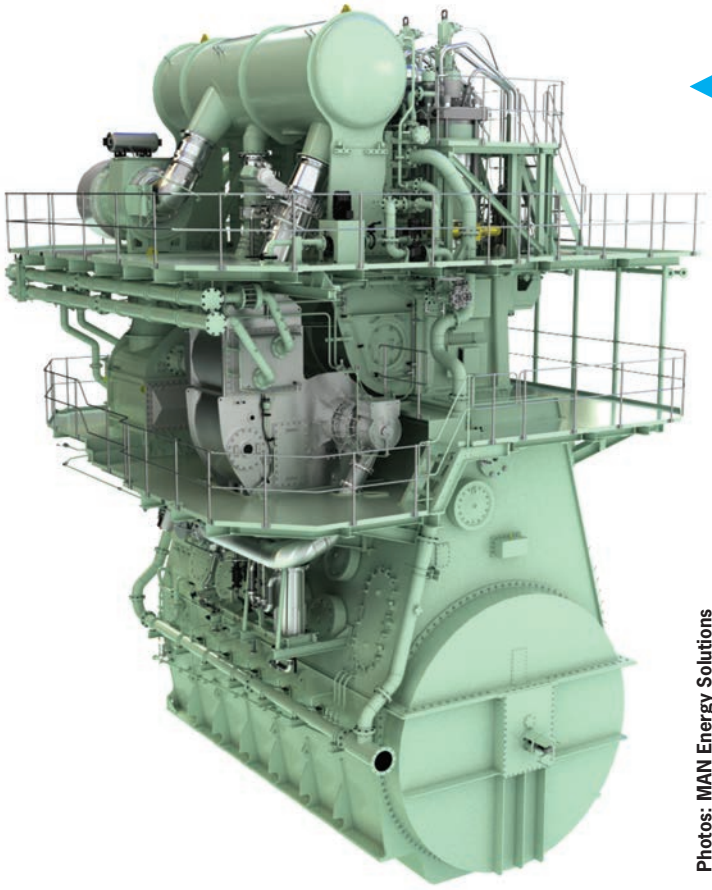
In a live-stream presentation from its Copenhagen Research Center, MAN Energy Solutions has demonstrated advanced dual-fuel engine technology for low-cost, fuel-efficient operation of LNG carriers and other vessels where low capital outlay is a priority.
Tom Mulligan, *Maritime Reporter's* Science & Technology Correspondent, reports.

MAN Energy Solutions has demonstrated its latest low-speed, dual-fuel engine, the MAN B&W ME-GA type, an Otto-cycle variant of the company's successful ME-GI engine, at a ceremony live-streamed from its Copenhagen Research Centre. The engine delivers a low CAPEX solution aimed at certain vessel types and applications, such as LNG carriers, which are able to use 'boil-off' gas as a source of fuel, or smaller ships where low capital outlay is a priority.

Minimal operational costs

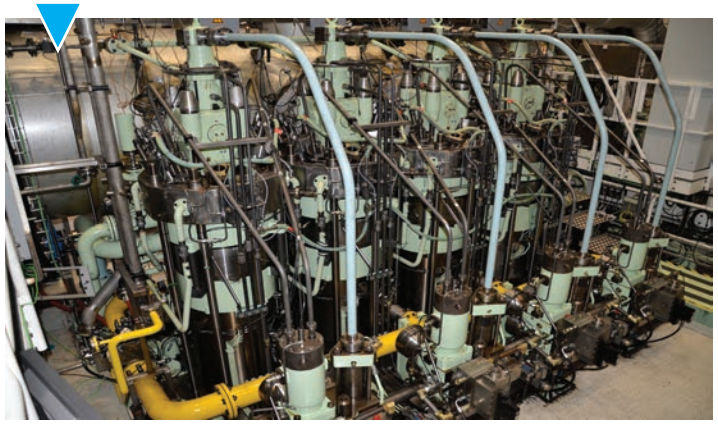
Based on the well-proven MAN B&W dual-fuel design with minimal installation requirements, the MAN B&W ME-GA uses an efficient ignition concept and unique gas admission system designed to deliver safe and reliable operation. Furthermore, the ME-GA features minimal operational costs, simple supply and purging concepts, and low maintenance costs for its fuel-gas supply system.

Wayne Jones OBE,Chief Sales Officer, MAN Energy So-



LEFT
The new dual-fuel ME-GA engine from MAN Energy Solutions comes with the company's proven Exhaust Gas Recirculation (EGR) technology for optimized performance, with specific gas/fuel oil consumptions reduced by ~3% and 5%, respectively.

BELOW
Based on the well-proven MAN B&W dual-fuel design, the MAN B&W ME-GA uses an efficient ignition concept and unique gas admission system designed to deliver safe and reliable operation. Pictured is the new engine under test at the MAN Energy Solutions Research Center Copenhagen.



Photos: MAN Energy Solutions

lutions, commented: "We initiated this ME-GA project in late 2017 when we recognized a strong market desire for a lower-cost alternative to the ME-GI engine, driven primarily by the LNG carrier market. Crucially, this new supplement to our dual-fuel portfolio continues our mission to decarbonize shipping and further the maritime energy transition to sustainable fuels."

MAN Energy Solutions' portfolio of two-stroke, dual-fuel engines has accumulated over 1.6 million operating hours from the 155 engines (6.3 GW) currently in service, all running on clean fuels such as LNG, LPG, ethane and methanol. With fuel prices and availability currently in flux, the company expects the option of retrofitting to dual-fuel engines to increasingly become a necessity.

Pre-mix Otto cycle Ops with Exhaust Gas Recirculation

The MAN B&W ME-GA dual-fuel engine works on a pre-mixed Otto cycle combustion principle in which scavenging air is let into the cylinder as the piston reaches bottom dead center (BDC) followed by gas being admitted as the piston moves upwards in the cylinder liner.

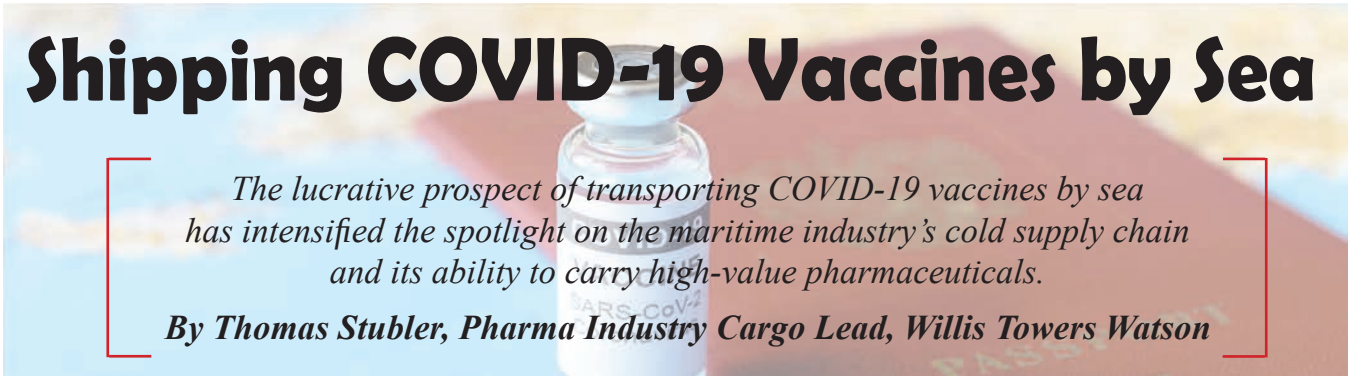
The pre-mixed air-fuel mixture is then ignited by means of pilot oil, combustion occurs, and the piston moves downwards, completing the cycle. An engine-mounted Gas Regulating Unit (GRU) enables depressurization of the system and the nitrogen purge block mounted at the aft of the engine enables purging without dedicated blow-off piping.

MAN Energy Solutions has included its proprietary EGR (Exhaust Gas Recirculation) system as an emissions solution for the new engine. EGR is a NOx emissions reduction technique that ensures IMO Tier III compliance in both diesel and gas mode. The EGR system will enable the ME-GA to reduce specific gas consumption by about 3%, and specific fuel-oil consumption by 5% and will also significantly reduce methane slip by 30 to 50% as well as solve the issue related to pre-ignition on Otto-cycle engines.

Other design concepts of the ME-GA engine include a G70ME-C10.5-GA cylinder condition with a ring package that ensures even pressure distribution and minimum deposit build-up in the ring grooves, while also providing significantly more robustness against ring collapse.

MAN Energy Solutions aims to start testing the first, commercial ME-GA design by the end of this year, with the first engine delivery following in early 2022.

Shipping COVID-19 Vaccines by Sea



The lucrative prospect of transporting COVID-19 vaccines by sea has intensified the spotlight on the maritime industry's cold supply chain and its ability to carry high-value pharmaceuticals.

By Thomas Stubler, Pharma Industry Cargo Lead, Willis Towers Watson

The lucrative prospect of transporting COVID-19 vaccines by sea has intensified the spotlight on the maritime industry's cold supply chain and its ability to carry high-value pharmaceuticals.

At present, speed to market is critical to stemming the spread of the pandemic, so the vaccines are being shipped by air to international destinations. Delivering them by sea is a longer-term strategy; certainly, the present urgency would have to calm considerably before enough confidence could be built to support delivery times in weeks, rather than hours.

While the majority do not expect COVID-19 vaccines to be carried by sea soon, there are some container lines, particularly those with established 'cold chain' infrastructure, partners and expertise, who believe opportunities could materialize before the end of the year.

Some lines that are already moving other vaccines believe sea transport will become 'relevant' to the COVID-19 variety as soon as the volume outputs from manufacturers become more predictable.

In general, container-shipping lines have had success prising a growing portion of the global market for pharmaceuticals away from their air-transport competitors. Pre-COVID, it was estimated about 3.5 million tonnes of pharmaceuticals moved by sea each year, against 0.5 million tonnes by air.

Revenues for the broader 'cold chain' industry – the 'refrigerated' part of the end-to-end supply chain – itself were estimated at $73B last year, and growing.

Pharmaceutical shipments have slowly migrated to the sea for the past 20 years as confidence grew in the quality and security of the marine 'cold chain'; for example, AstraZeneca, one of the makers of COVID-19 vaccines, reportedly increased the proportion of pharma products it ships by sea from 5% in 2012 to nearly 70% in 2017.

Because vaccines are volatile and valuable, it follows that their owners will priortize using experienced cold-chain carriers to get their products to market. The Pfizer-BioNTech vaccine, for example, must be consistently stored at -70C, or it will be rendered unusable. The vaccines of its competitors Moderna (-20C) and AstraZeneca (2C-8C) have less demanding temperature requirements, but they are still subject to stringent environmental quality and security controls during transport. Aside from environmental-control requirements, risk assessments for insurance contracts for pharma shipments by sea need to consider the comparatively high product valuations per conveyance. As pharma shipments that travel by sea are generally larger than those sent by air, the totally lost COVID-19 vaccine shipment could represent a loss as high as $50M.

Because the COVID-19 vaccines are highly valuable and potentially volatile, insurance contracts need to be carefully constructed to respond to the characteristics of each shipment. Standard limits to liability established by national regulatory bodies are likely to fall short of shipment valuations and, as there is no standard global template to limit liability, it's important that each policyholder shares their unique risk profile to establish the limits of the policy prior to its inception.

Limits of liability are typically established according to the maximum value of the carrying conveyance, with the onus on the policyholder to provide proof. Insurers will generally provide limits up to the value of the cargo transported and most pharmaceutical companies have large insurance limits, which can be subject to limits on accumulation and can be substantial.

Limits per shipment are not specifically set for COVID-19 vaccines. But, as a loss under a transport policy would very likely result in a loss of sale (as replacements are unlikely to be readily available), it's currently likely the shipper of the vaccines would expect compensation to be based on the selling price.

The vaccines' retail price has been estimated by some manufacturers at $20-$25 per dose. With World Health Organization expecting up to 25% of the vaccines to be ruined every year due to poor temperature control, it is easy to see how the financial risks could rise considerably for all parties.

Also, because cyber attacks are a real risk for such socially vital cargo, all parties should ask whether standard marine cargo policies would respond to an attack that damaged their vaccine consignment. Using the International Maritime Or-

ganization's Cyber Security Guidelines as a foundation, those involved in the distribution of vaccines will need additional comfort that their transportation providers are also compliant with other guidelines and/or have a robust framework in place to protect them from this emerging risk.

Many marine cargo policies have multiple cyber exclusions that could rule out compensation for loss, damage, liability, or expenses stemming from an event with "malicious intent" to cause loss, whether directly or indirectly.

Also, 'exclusion' is a very broad term that is widely used in dedicated cyber policies, so insureds would be wise to ask whether their marine cargo policy would protect them in the event of shortfalls brought about by any cyber-exclusion language.

Cyber cover has come under a brighter spotlight since the Prudential Regulation Authority, which supervises about 1,500 financial institutions including banks and insurance companies, made it mandatory from January 1, 2020, that contracts of insurance in the London market become affirmative on cyber protection, as opposed to 'silent'.

As such, the prospect of clients transporting volatile and highly valuable COVID-19 vaccines will receive heightened scrutiny from the insurance community. In today's market, marine insurers will want more details about most of the links in their client's supply chain and its third parties, before underwriting. These questions could include:

- Carrier and warehouse vetting processes
- Details of any loss-control or risk-management protocols and tools, such as GPS tracking devices, temperature-recording devices, etc, including whether those items are monitored by the policyholder's employees, or third parties, even in warehouses
- Details of contingency plans in the event of a conveyance breakdown at any point within the transit from origin to final destination
- For temperature-controlled shipments, how are the goods packed/transported to minimise the potential for changes in temperature?
- What security measures exist to minimise potential of theft and non-delivery of products

Any marine cargo insurance policies – even for experienced pharmaceutical carriers – will need to be re-examined to ensure they will respond to the risks inherent in carrying these precious goods.

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Is there a different future for Ship Repair & Conversion?

By Rik van Hemmen

There is an old adage that states that a repair yard can economically build new ships, but a new construction yard should never touch ship repair jobs. In my experience there is a lot of truth to that statement, and it does not mean that new construction yards are run by less capable people; it simply means that ship construction and ship repair and conversion are fundamentally different business models. Ship construction uses a script, while ship repair and conversion is improvisation. I will not drive the theater comparison completely home, but it has some validity. Improv actors can end up in major movies, but I am not aware of much movement in the other direction.

A good repair yard can improvise itself through a one-off construction job, but even a relatively simple repair in a new construction yard can quickly result in a financial and scheduling nightmare. Even rework in a new construction project

The 'Cutting Edge' in Ship Repair

- **Full digital construction model**

3D CAD is nice, but where digital modeling becomes really valuable is the inclusion of detailed parts information. Shipbuilders are operating at this level, but repair yards rarely are provided with these details.

- **Laser scanning**

Laser scanning is already being used for dimensional determination and verification by ship repairers, but where laser scanning becomes even more valuable is for confimation between as designed and as built dimensions. If the model and the as built dimensioning can be tightly integrated the construction as repair or conversion modules can be performed neat.

- **Drones**

Drone inspection are still in their infancy and inspections is only the tip of the drone iceberg. Ships are big and staging is expensive. Anything that replaces staging or human climbing saves money in ship repair and concersion

- **3D plastic printing**

3D plastic printing has limited use in commerical ship contruction, but should also not be underestimated. Some parts may be reproducable with 3D printing and if new ship parts are 3D printed the repair part can also be 3D printed. Meanwhile 3D printed parts can be invaluable in jigging, patterns or spacers.

- **3D metal printing**

3D metal printing is still in its infancy as far as direct application in ship building and repair is concerned, but the promise is spectacular and may be even higher in repair and conversion than new construction

NC cutting and machining NC cutting is already quite common in ship repair facilities, since even rough and simple NC part cutting saves money, but to cut exact parts from an exact model will introduce an additional huge repair cost saving.

- **Automated welding**

Various automated welding approaches are already being used by repairers, but closer tolerances in modeling will increase the use of automated welding approaches.

can result in a financial disaster and we often advise against a new construction yard engaging in repairs even if the damage occurred in their own yard. On the other hand, we also often encounter too much improvisation in repair yards. Good planning, tight process control and use of the most mature new construction approaches can provide interesting opportunities for the maritime community in ship repair and conversion.

There has been a revolution in ship construction and only a small portion of that revolution has been adopted in the ship repair and conversion community. The adoption of those technologies, approaches, and systems into ship repair could very well change the way ship owners and operators regard repair and conversion and that would result in new repair and conversion approaches.

Major steel repair projects traditionally required the vessel to enter the repair yard and involved detailed surveys assisted with ship's drawings which then resulted in a repair plan. There may be CAD drawings and even a rudimentary 3D model, but only the newest ships would be fully built, configured and assembled with a full CAD model. A full CAD model with all material properties, suppliers, part numbers and models would make a major steel repair planning a hands off routines as long as the damage extent is known. Once the damage extent is known the full design model can be used to design the most efficient repair.

I am not stating anything new here, but today this approach is rarely applied. I have yet to attend a major steel repair project where this level of information transfer actually occurred. I can see there are various hurdles, and, almost ironically, the vessel's builder may actually muscle in on the repair project because they hold the keys to the deeper data and can therefore reduce the repair cost.

I am not saying the builder will be successful in getting the project, because ships have a nasty habit of getting damaged in locations that are some distance away from her place of birth, and often the vessel is incapable of being economically moved. Regardless, this shows that technology adoptions result in business model shifts.

While I have not seen the use of full digital models in a large steel repair job, the recent installation of Ballast Water Treatment systems and scrubbers has made much more use of digital construction details especially in the planning phase, and these modifications were much more cost effective when a full E/R 3D model was available.

So let's dig a little deeper, because there are number of

Students Learn, the Fleet Saves: Naval Post

By Edward Lundquist

The Navy is a step closer to achieving the vision of being able to fabricate parts on demand. Xerox and the Naval Postgraduate School (NPS) have announced a strategic research collaboration to advance 3D printing and additive manufacturing.

As part of a Collaborative Research and Development Agreement (CRADA) between NPS and Xerox, a Xerox ElemX Liquid Metal Printer has been installed at the school's Large Experiment Annex on campus. *NPS is the first site anywhere in the world to install this new technology.*

"From the age of sail to the nuclear era, Sailors have been fixing things at sea so they can complete the mission, said NPS President retired Vice Adm. Ann Rondeau. "This partnership is about the strategic ability of the Navy to have Sailors on ships with the capability through creativity and technology to advance their operations at sea. Through collaboration, NPS and Xerox, with the support of the NPS Alumni Association and Foundation (NPSAAF), are helping build a Navy for the 21st Century."

With access to the ElemX liquid metal printer and other state-of-the-art additive manufacturing equipment, NPS faculty and students will be able to design and create on-demand items as part of thesis research.

Creating parts when needed not only contributes to readiness, but also reduces reliance on lengthy, complex logistics chains.

"Global supply chains leave industries like aerospace, automotive, heavy equipment, and oil and gas vulnerable to external risks," said Tali Rosman, Xerox Vice President and General Manager, 3D Printing. "Our goal is to integrate localized 3D printing into their operations, and the real-time feedback from NPS gives us actionable data to continuously improve the ElemX."

The CRADA agreement benefits the naval service as well as Xerox. "The military supply chain is among the most complex in the world, and NPS understands first-hand the challenges manufacturers must address," said Xerox Chief Technology Officer Naresh Shanker. "This collaboration will aid NPS in pushing adoption of 3D printing throughout the U.S. Navy, and will provide Xerox valuable information to help deliver supply chain flexibility and resiliency to future customers."

According to retired U.S. Marine Corps Col. Todd Lyons, NPSAAF vice president, providing the right digital tools and the liquid metal printer has helped transform the supply chain, as well as how the Department of Defense (DoD) thinks operationally about supplying war. "This is one way to bend the cost curve so that the DoD is not spending a thousand dollars for every dollar that a peer competitor spends," Lyons said.

technologies that are pretty well established in ship construction that could come into play in ship repair and conversion and may dramatically change the game.

The box on page 23 shows a list of technologies and my take on their present adoptions.

So how would ship repair and construction industry change with the adoption of these technologies?

It becomes economic math. If it is cheaper to build new than convert; shipowners will build new. But if it is cheaper to repair or convert; shipowners will repair and convert.

Especially with regard to conversion, the availability of a full digital model of the ship is an astonishing cost saving. I am presently involved in a complex conversion project where there is no original digital model. The conversion yard knows how to use many of the tools I mention (especially NC cutting and machining) and will take full advantage of them, but the creation of the model and then the conversion design is a very significant percentage of the overall project cost (and timeline). If the original digital design were available, I estimate the conversion cost would be reduced by 10% or more.

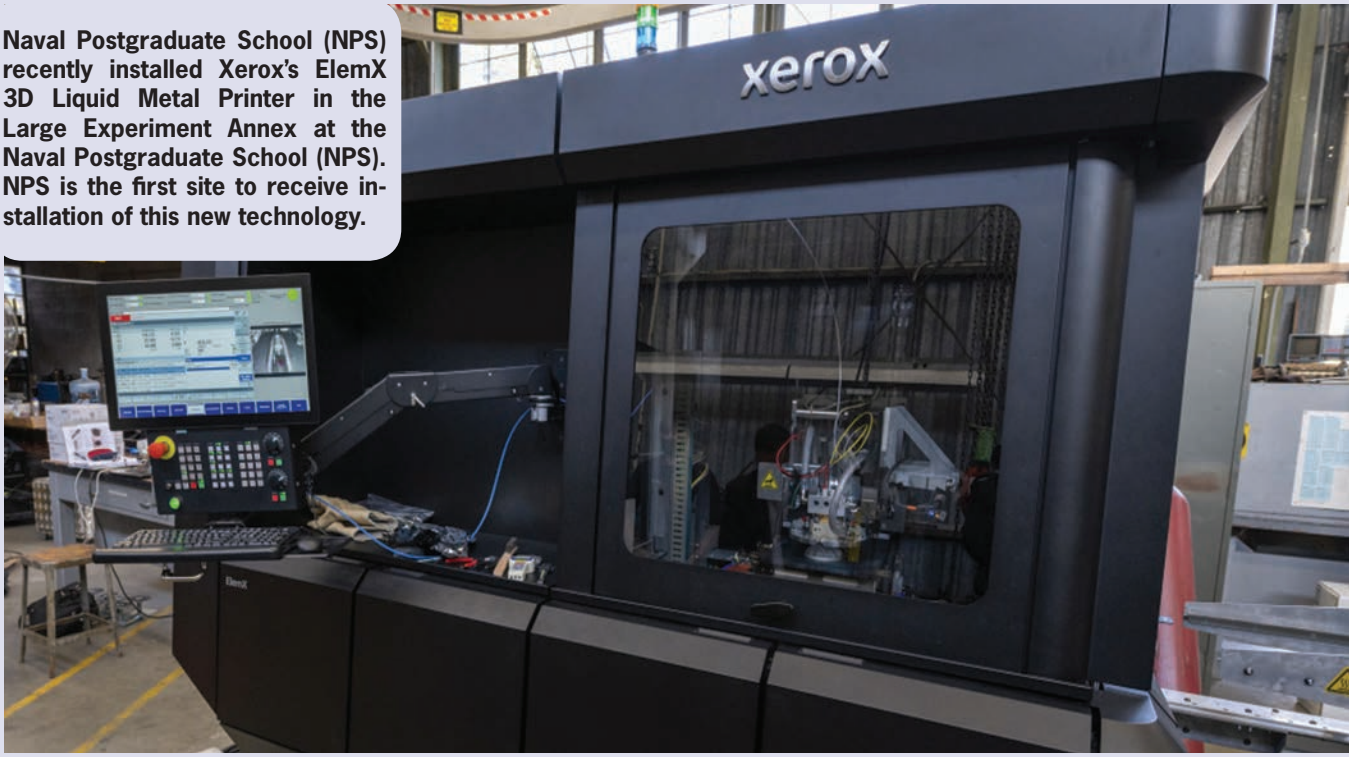
Today shipbuilders hold the technology edge, but once these technologies become firmly imbedded in the repair and conversion industry, the cutting edge will shift. This is nothing new. Change is constant and these shifts have occurred in maritime and ashore. The US maritime industry was heavily skewed to repair due to high ship construction costs (and still is in the Great Lakes) and car repairs will be much reduced in the coming years if EVs become dominant.

Interestingly, as far as ship repair and conversion is concerned, central to all of this is access to the full digital ship construction model. As near as I am aware, shipbuilders are far from eager to provide it to the vessel purchaser, since it is a serious bit of intellectual property. But in a weak building market everything is negotiable, and to have the model leave the shipyard with the ship or to ensure full access to the model in the ship construction contract may very well be the bell weather in a shift in ship repair and conversion. As a general benefit it may increase ship useful lives and reduce waste and scrapping problems. Now if we can make ships from less corrosive materials (see **https://www.marinelink.com/news/eye-design-a-titanium-uss-enterprise-ncc-478807**), who knows how fast things will change.

For each column I write, MREN has agreed to make a small donation to an organization of my choice. For this column I nominate Mystic Seaport, an organization with one of the country's most important repair shops.

tgrad School adds Xerox ElemX 3D printer

Naval Postgraduate School (NPS) recently installed Xerox's ElemX 3D Liquid Metal Printer in the Large Experiment Annex at the Naval Postgraduate School (NPS). NPS is the first site to receive installation of this new technology.



(U.S. Navy photo by Mass Communication Specialist 3rd Class Lenny Weston/RELEASED)

Facing Maritime's Challenges Head-On:
"That's why we are here: Engineers."

Based in Shanghai, Krzysztof Kozdron – or "KK" as he's known to many of his Chinese colleagues, clients and friends – is the Managing Director of Schulte Marine Concepts (SMC). As SMC passes a milestone in ship construction project management, Kozdron shares his insights on shipbuilding and repair activities throughout Asia.

By Greg Trauthwein

Starting in 1973 to today, Schulte Marine Concepts has managed 600 ship construction, repair & conversion projects, starting with its own vessels and evolving into a company today that manages the majority of its projects for third-party clients. The list of projects managed by SMC is both long and broad. While Kozdron says with a laugh "I haven't been around that long, but today we have a global presence, building ships starting from East to West. That '600' includes virtually each and every type of vessel, because we are not dedicated to any one particular type or class."

Today, despite the impact of COVID-19, SMC has 91 vessels under construction in Korea, China and also in Europe. "It's quite interesting that after many years we managed to get back to Europe," said Kozdron. "It's good to be back home."

Full Speed Ahead

Despite the impacts of COVID-19 globally, Kozdron said that in Asia, "today, shipyards are working at full speed," noting that most of the inconvenience comes from clients and ship managers trying to come over to take delivery of the vessel. At the outset of the pandemic completing contracts, which traditionally were done face-to-face, was a struggle, but said that clients have generally settled into a comfort zone in conducting contract negotiations and signing via video conference. "The first few contracts were challenging, but to-

"What is interesting are the new trading routes, particularly the Northern corridor, that is creating new opportunities for the shipowners and shipyards with the demand for new vessel concepts and type."

Krzysztof Kozdron, Managing Director, Schulte Marine Concepts (SMC)

MARITIME REPORTER TV **Watch the full interview with Krzysztof Kozd on MR TV: bit.ly/3u3wSKC**

day it is a comfortable and efficient," said Kozdron. "COVID has had no adverse effects on the shipbuilding capability and capacity here in Asia."

While traditional business drivers in the newbuild sector – economic interest and investment opportunity – are still a bit fuzzy as COVID lingers, Kozdron sees emerging drivers that should keep shipyards busy.

"What is interesting are the new trading routes, particularly the Northern corridor, that is creating new opportunities for the shipowners and shipyards with the demand for new vessel concepts and type," said Kozdron. In addition to new routes, new cargos – such as the growth of ethane – are driving innovation and investment in new ships and ship technology. "The LNG bunkering sector (too) is a completely new type of the vessel being driven by environmental consciousness and awareness."

Looking ahead, he reasons that newbuild demand will have to ramp up substantially, driven by a historically low newbuild orderbook premised on economic uncertainty over the past 12 months, and the transition to new fuels and technologies designed to dramatically reduce ship emissions. "Maybe not today, but in the future" new shipbuilding demand will return with a vigor.

Schulte Marine Concepts Fast Facts

- **600** Number of shipbuilding and repair projects SMC has managed since 1973.
- **80/20+/119** SMC has worked in more then 80 shipyards 119 clients.
- **$500K to $800M** The range of project size managed, from a ferry boat ($500k) to an FPSO ($800M).

Energy Conversion as a Driver

While much focus today in maritime is on alternate fuels and 'fuels of the future,' Kozdron sees the fuel transition through a different lens, particularly when it comes to ship conversions. "Imagine a place that requires electrical power, but there's no power plant in the vicinity: What do you do? You convert a ship into a floating power plant." He said the proliferation of fuel changes to shore-based power plants – from oil to natural gas for example, are also helping to drive the FSRU conversion market today.

"(Converting a power plant) from fuel oil to natural gas is relatively simple work," said Kozdron. "What's more difficult is to find the gas that you can feed the power pump. So what is happening is that a lot of FSRU conversion projects are popping up and they are creating a temporary patch until the pipeline to supply the gas is installed."

Opting for a conversion versus a newbuild in these and other instances usually boils down to mathematics, but not necessarily in regards to CapEx, Kozdron said. "If you look at the CapEx, of course a conversion would be cheaper than a new build. But it's not all CapEx. It's the shorter delivery date," he said. "A new building can last 24 to 30 months while a conversion, if properly prepared and executed, can be completed in six to 12 months, giving you the advantage of a shorter delivery date."

That said, the alternative fuel discussion and decision will be a driving force for shipowners now and in the coming decads.

"A big challenge for the owners to develop a new building project today is driven by the demands of making vessels more environment-friendly, which brings us to alternative fuels and available technology," said Kozdron. "On the fuels, unfortunately we don't have too many alternatives (today). We talk about LNG, LPG, ammonia and methanol. The diffi-

"Put simply, vessel are supposed to burn less fuel and carry more cargo. So it's an ongoing challenge for designers to make vessel more efficient from the hydrodynamic perspective. There's a challenge for equipment makers, too. "

culty is their availability. While we can get (alternative fuels) easily in the major shipping hubs, vessels are not always privileged with sailing from Singapore to Shanghai or to Hong Kong. They usually go to remote places, and availability of these fuels is problematic."

The 'chicken and the egg' scenario regarding fuel transition and fuel availability has been ongoing for years. But there remain technical and logistics hurdles, too.

"Once you decide (on an alternate fuel) you need to have equipment, machinery capable of being operated on these fuels. The technology is (still) lagging behind." He said while the LNG tech and logistics have arrived, he noted "we are almost there with LPG, however, methane and ammonia are still in their infancy."

"There's always a certain level of risk involved in stepping into technology that is not yet mature and proven, especially in marine applications," said Kozdron, noting while there is nothing new to operating engines on methanol, the challenges of doing so efficiently, effectively in the marine environment "is a completely different situation, a challenge."

Finally, while the alternate fuel discussion is a big one, it is far from the only engineering challenge facing ship owners today. "Driven by environmental expectations is overall energy efficiency of the vessel," said Kozdron.

"Put simply, vessel are supposed to burn less fuel and carry more cargo. So it's an ongoing challenge for designers to make vessel more efficient from the hydrodynamic perspective. There's a challenge for equipment makers, too. So the list of challenges is quite long, but, that's why we are here: Engineers."

2021 The Year When Offshore Wind Takes Off in the U.S.

By Philip Lewis IMA/WER

All graphics: WER Database

After several false starts, 2021 is the year when the offshore wind industry begins to realize its potential. At least 30 offshore wind projects are forecast to be developed within this decade. Ports, fabricators, component manufacturers, vessel operators, engineering firms and lenders will benefit from the $87.5B CAPEX, $2.8B annual OPEX, and $12.5B DECEX opportunity.

Despite being the 2nd largest global market for onshore wind, the United States is today a minor player in offshore wind in comparison to the European and Asian offshore wind markets. Two operational projects for a total 42MW of installed capacity were installed in the USA at the end of 2020 versus a global offshore installed base of 34GW.

2021 will deliver a step change in offshore wind activity in the US as the journey accelerates to develop the 27.6GW project pipeline within this decade.

These are the findings shared in a recent report on the US offshore wind market in this decade by World Energy Reports (WER).

The 170+ page report examines the business conditions likely to drive offshore wind project development in the US within this decade, forecasts the number, CAPEX, OPEX and timing of projects, and provides a roadmap to accessing these market opportunities.

Offshore Wind Overview

From the first eleven 450kW WTG 5MW Vindeby Windfarm, commissioned in 1991 in Denmark, offshore wind has grown to reach 34GW cumulative installed capacity by the end of 2020 provided by 18 countries.

Europe has played the leading role to date, accounting for 73% of capacity and a significant industrial base for wind farm component manufacture and logistics capabilities.

China has recorded a surge in capacity since 2015 to reach 23% of global capacity by the end of 2020.

The largest three markets at the end of 2020, the UK, China, and Germany, accounted for ~78% of global installations.

Whereas the European, Chinese, Taiwanese, and Vietnamese markets will continue to remain strong throughout the decade, we expect to welcome South Korea, Japan, and the USA

Summary Forecast for US Offshore Wind Projects

Summary Forecast ($bn)	GW	CAPEX	Annual OPEX	DECEX
Short-term projects	9.0	28.9	0.9	4.0
Mid-term projects	10.3	32.5	1.1	4.8
Longer-term projects	8.3	26.1	0.8	3.6
Total	**27.6**	**87.5**	**2.8**	**12.5**

to the stage of global scale players within this decade.

In the mid- to long-term, we are tracking offshore wind projects in 38 countries.

As the industry matures in key markets, CAPEX and OPEX costs are falling making offshore wind more competitive.

Reducing from a global average $170/MWh in 2010, 2016 to 2018, European and US auctions have seen strike prices in the $60/MWh to $110/MWh range. The strike price represents the all-in-cost per MWh to develop an offshore wind project. It reflects the guaranteed revenue for the operator.

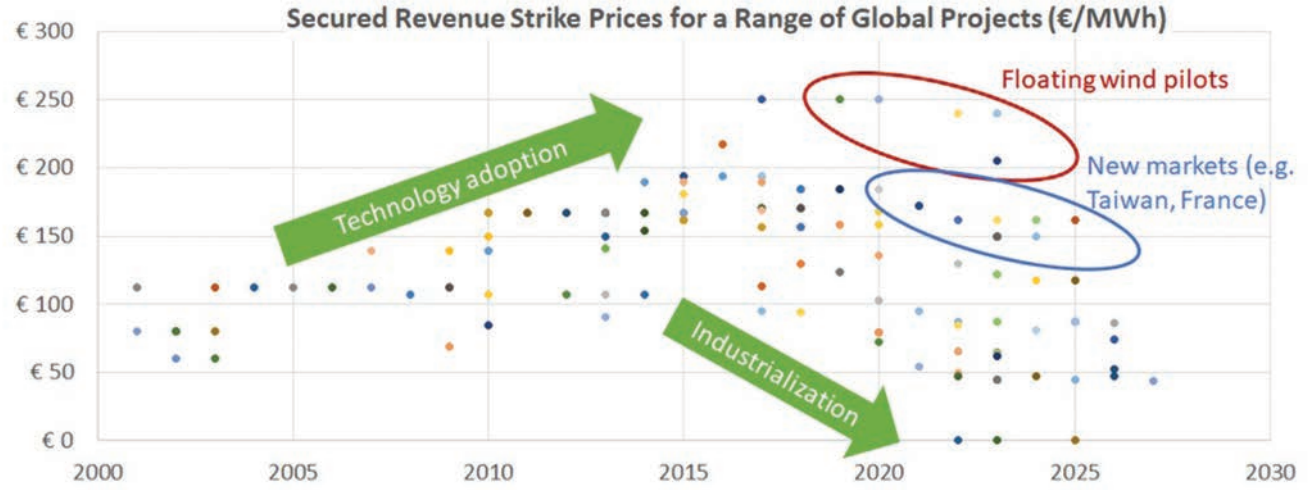
US wind projects will enjoy some of the costs benefits achieved from the growth of the European offshore wind industry. The utility scale projects due to come online over the coming five or so years in the United States will generate revenue in a range of $70/MWh to $137MWh. These pricing levels have been reached much earlier than has been seen in the European and Taiwanese industry.

One of the drivers for offshore wind cost reduction is the development of larger turbines, which help to reduce overall foundation, cable, and maintenance costs. Projects in the US will mostly deploy the largest commercially available turbines.

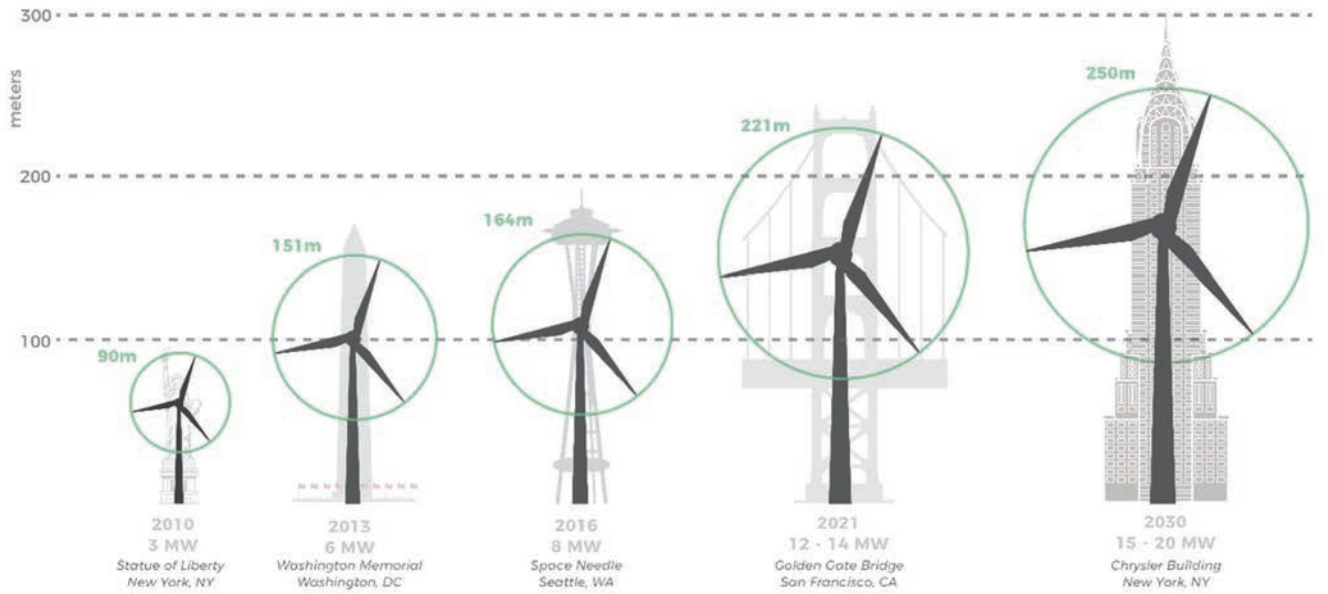
Offshore Wind in the United States

The current US nameplate power generation capacity is ~1,200GW. The US DOE's NREL has quantified the offshore wind net commercially feasible resource at 2,060GW. This is almost two times today's total electricity generation capacity. Wind resource is available in 29 states along the Atlantic, Pa-

Strike Prices Trend for Bottom-Fixed Offshore Wind



Wind Turbine Size Evolution



cific, Gulf of Mexico, and Great Lakes coasts.

This decade will see utility scale projects in the relatively shallow and near shore waters of the northeast and mid-Atlantic. These projects will mainly adopt the bottom-fixed solutions found in the established European and East Asian markets.

We are also forecasting the demonstration of offshore wind technology in the Great Lakes and two floating wind pilots in the Atlantic within the decade.

The Main Players

The federal government promotes and regulates offshore wind in the US. Around 90% of the identified commercially feasible offshore wind potential is in federal waters. One offshore wind project, the Coastal Virginia pilot, is operational in federal waters. The main federal agency, BOEM, is reviewing construction and operations permits for 11 projects for 9GW. The approval of the first of these projects, Vineyard, has been significantly delayed due to the extended environmental impact assessment review process. However, it is expected that Vineyard will receive construction and operations approval within the first half of this year. This in turn will unblock the queue of project seeking review and approval. A further 9 projects for 10.3GW are preparing their applications for construction and operations approval and another 8 projects for 8.3GW are assessing and surveying the sites to establish construction and operations plans. It is the states who drive demand through policies targeting renewable energy procurement. 30.5GW of specific offshore wind procurement targets have been announced and close to an additional 1.4GW of procurement commitments have been made. A group of 16 developers will deliver the project forecast. This group include leading European developers, renewable energy asset investment companies, US utilities and European oil & gas companies.

A 27.6MW Project Forecast

As of March 2021, there are 11 projects for 9GW in the federal construction and operations review queue. These should be the first projects to receive approval and move to the construction phase in the short-term. We are forecasting most of this capacity to come on stream between 2023 and 2027.

The mid-term forecast represents those projects that are undertaking site assessment work and are expected to start submitting construction and operations plans for review and approval within this year. Developer planning indicates commissioning of these projects between 2025 and 2030. Given the current federal permitting review delays, we anticipate some movement on these commissioning dates.

The longer-term forecast brings together projects on secured federal leases that are at earlier stages of site assessment. These all need to be commissioned before 2035 to meet state procurement targets.

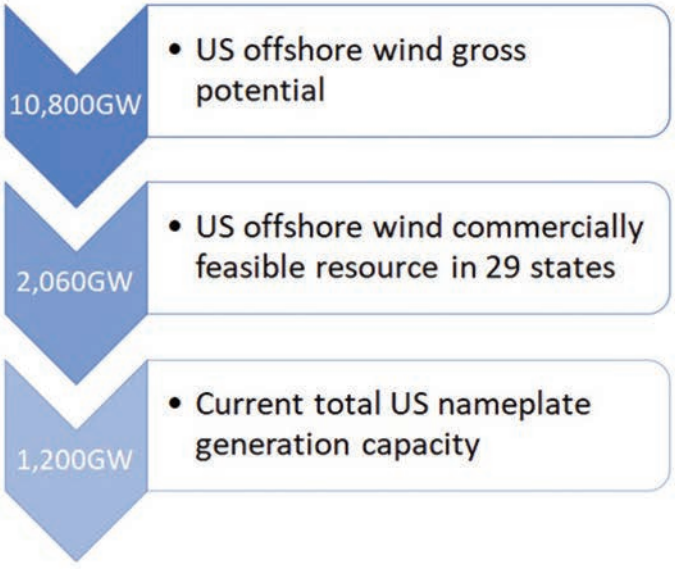
It should be noted that the current identified projects will not deliver enough capacity to meet northeast and Mid-Atlantic state procurement targets by 2035. More project capacity will be identified from existing federal leases and from new Atlantic leasing activity, expected to be rolled at the end of this year or early next year.

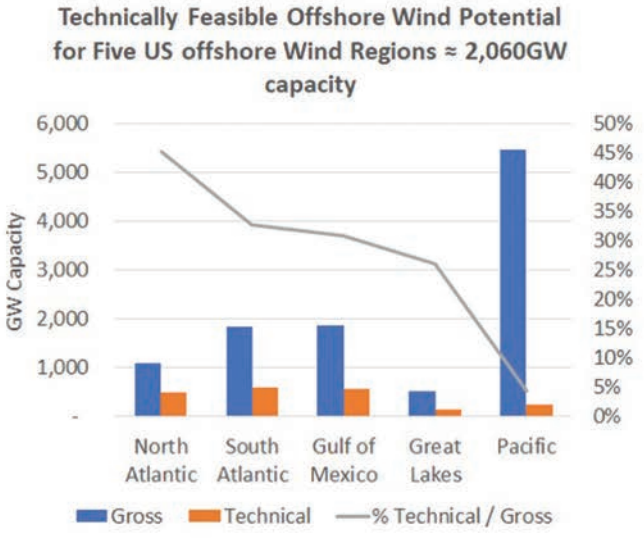
A $87.5bn CAPEX and Annual $2.8bn Opportunity

Our bottom-up forecast model breaks the $87.5bn of CAPEX into component spend. We are forecasting close to $60bn to be spent on material supply, manufacturing and/or fabrication of turbines, cables, foundation structures and other equipment.

We anticipate around $25bn will be spent on installation and commissioning activities. The Jones Act supports US

US Offshore Wind Potential





built, owned, and operated vessels. This means that foreign flag installation vessels will not be able to shuttle components from US ports to the construction site, as is the practice in the developed European and East Asian markets. There is limited Jones Act compliant turbine, foundation, and cable installation capacity. This can lead to project delays or increased costs as developers compete for scarce foreign flag tonnage and comparatively high-priced Jones Act new buildings or select less efficient/cost competitive combinations of foreign flag installation vessels and domestic feeder vessels.

There will be a significant investment in US port infrastructure because of offshore wind developments. Around 50 ports along the northeast and Mid-Atlantic coast have been identified as potential candidates to support construction and marshalling activities. Over $1bn of investment commitments have already been identified. As with offshore oil and gas projects, a significant amount of lifetime project cost in an offshore windfarm is represented by routine planned operations and maintenance. For an offshore windfarm this is typically 40-45% of the lifetime cost. Our forecast identifies around $2.8bn of annual recuring OPEX once the identified projects are commissioned.

Wind farm operators will set routine inspection and maintenance schedules, chartering in long-term vessel support for the activities. The tonnage will be mostly Jones Act Vessels. Certain vessel categories can be modified/redeployed for the existing Jones Act fleet. Other requirements call for new buildings.

Offshore wind going forward

States are continuing to discuss with federal agencies the development of future offshore wind activity.

In the coming years, we expect to see new federal leasing activity in the Atlantic and Pacific. We also anticipate further investigation by states of the potential in the Great Lakes.

Competitive floating wind solutions are certainly required to open the potential off the continental and Hawaiian Pacific coasts. But many are often surprised to learn that the first floating projects in the US will be in the Atlantic. In terms of technology development, our project forecast already includes two floating offshore wind demonstration projects to be commissioned off the Atlantic Coast. Details off all the projects in the forecast are provided in our report found here:

https://usoffshorewind.worldenergyreports.com/OffshoreWindPowerUS

INSIDE THE RED-HOT OFFSHORE WIND MARKET

As the traditional offshore oil and gas markets continue to struggle, the renewable offshore wind market is hot and getting hotter.

By Barry Parker

As the cumulative maritime, offshore, port and logistics marketplace gears up for offshore wind energy on a huge scale, World Energy Reports (WER), in its report *"2021 The Year When Offshore Wind Takes Off in the United States,"* shows the anticipated growth trajectory. Service Operations Vessels (SOVs), which can commission and/or maintain turbines, are central to the plan, and Philip Lewis, Director of Research, WER's, explains that SOV's are deployed for several functions:

1. Turbine commissioning work during the construction phase for the turbine OEM, with campaigns planned in terms of months of activity and vessels deployed for relatively short periods.
2. Turbine maintenance for the O&M phase – this can be the turbine OEM as part of the warranty period (typically 2-3 years) or by the turbine OEM under a service agreement. Alternatively, it can be the wind farm operator.
3. General wind farm operations and maintenance by the wind farm operator for their planned routine inspection, repair, and maintenance activities. For most large windfarms, these can be 20-30 year deals.
4. Major offshore repair and maintenance for unplanned events, calling for the spot charter of specific vessels.

"Around 65% of the operational capacity and forecast for this decade will be within 50km from shore; for O&M, this generally drives Crew Transfer Vessel or CTV demand," said Lewis. "For offshore O&M support, SOVs are generally competitive over 50km. This is because of the time taken to transit

Bureau Veritas

between shore and the wind farm, weather related availability and passenger comfort and safety."

Recent months have seen a raft of new design and construction announcements. In the U.S. market, energy behemoth Ørsted, in conjunction with regional utility Eversource, announced they were entering into a long-term charter on a Jones Act qualified SOV that would initially be operating out of a base to be built in Port Jefferson on Long Island, serving three projects in the Northeast: Revolution Wind, South Fork Wind and Sunrise Wind. "Chartering strategies for SOVs, or CTVs for windfarms closer to shore, are still emerging," said Lewis. "As an example, turbine OEMs could possibly employ an SOV across multiple installations, during the commissioning and warranty phases."

The description of the 260-ft. EPA Tier 4 compliant diesel electric vessel, to be built in yards owned by privately held Edison Chouest Offshore (ECO), highlights the key attributes for SOVs. ECO describes the newbuild as "… a special-purpose design with focus on passenger comfort and safety, enhanced maneuverability and ship motions, extended offshore endurance and reduced emissions." The vessel, as described, will have accommodation for 60 passengers, with a below deck warehouse (served by an elevator). A daughter craft, served by a height compensating landing platform, will be used for ferrying workers and equipment to the individual turbines for maintenance and repairs.

The choice of ECO (with an OSV fleet active in the Gulf of Mexico, Alaska and in Brazil) as a builder underscores an important trend: the transfer of offshore oil and gas experience (and on occasion actual vessels) into the burgeoning wind arena. But with offshore wind driven by a pivot away from fossil fuels, the "green" aspects are critical in the new wave of service vessels to be built; every newbuild or design announcement checks that box. On the ECO newbuilds, the electric motors tied to the vessel's cyclorotor propellers will employ a Variable Frequency Drive (VFD), in a design proprietary to ECO.

SOV Designs for the U.S. Market

Multiple SOV designs have been announced for the U.S. markets. Vard Marine, the ship design arm of Fincantieri, has received Approvals in Principle (AIP) for two SOV's that could be built in U.S. yards. The compact 4 07 design, with 2,700 kW of propulsion power (suitable to carry 60 technicians) was announced in late 2019, while the larger 4 19, with 3,000 kW of propulsion power and capable to carry 90 technicians, gained the AIP in August, 2020. The 4 19 layout (with a full size helideck, and a 27m gangway) contemplates that battery power could be added later on, with space on deck for a future retrofit.

Wärtsilä Marine has also presented a 76m Jones Act compliant SOV design, which it describes as a " hybrid multi-purpose SOV," adding that: "The designers also worked closely with classification societies including DNV and ABS, which both provided valuable input to the vessel design." Its announcement stresses that its "data driven" design process and its proprietary tools for optimizing engine performance. Wärtsilä also stresses the importance of integrating the vessel's dynamic positioning system (where it has extensive experience linking DP with propulsion) to components such as the walk to work gangway.

Vessel designers Technology Associates Inc. (TAI), based in New Orleans, have adapted its designs, well known in the Gulf of Mexico's oil and gas business, to the wind sector. The designer has introduced its EnviroMax Diesel-Electric Hybrid Service Operation Vessel (SOV) specifications for installation and maintenance of offshore wind farms. The TAI EnviroMax series of vessels have been designed to maximize operational capabilities, minimize fuel consumption and carbon foot print. TAI's EnviroMax SOV designs are being offered in the "S" (Small), "M" (Medium) and "L" (Large) Classes.

Coming to America

Northern Europe is where the offshore wind business began, but the U.S. growth projections are attracting these Eu-

ropean veterans. The Danish company Esvagt, in mid-March, announced a link-up with Jones Act veteran Crowley to participate in the burgeoning U.S. markets (See story pg. 40) Windea, a joint venture of a group of German shipowners, has also set its sights on the U.S. markets, setting up a new entity, Mid Ocean Offshore, in partnership with the U.S. entity Mid Ocean, which has experience in U.S. product tankers and, more recently, in LNG barging.

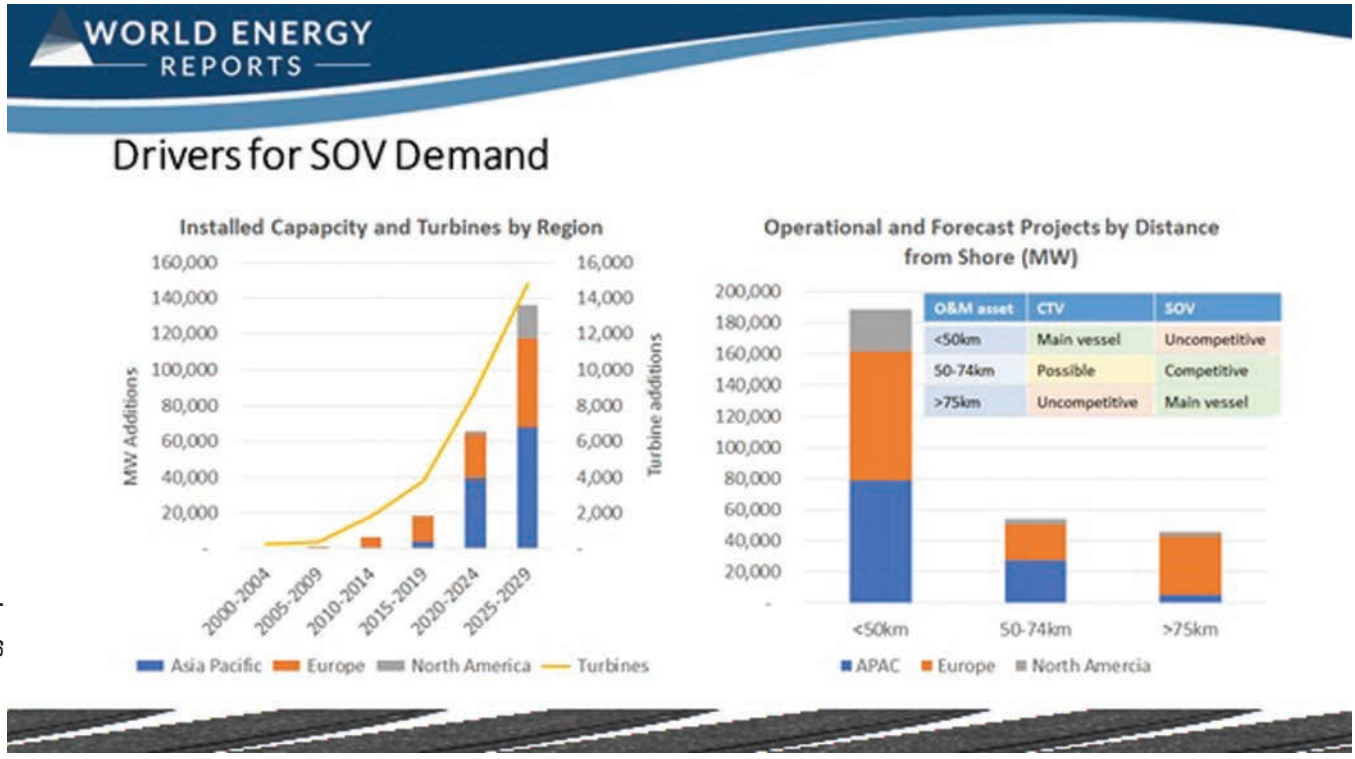
The North Sea has been a hotbed of SOV activity. Norwegian owner Edda Wind operates two purpose-built SOVs, Edda Mistral and Edda Passat, for wind markets. The company stresses the onboard 23m heave compensated gangways to allow technicians to safely "walk to work". The vessels' Rolls-Royce design also includes RR "…diesel electric main machinery, consisting of frequency controlled electric driven azimuth thrusters, super silent mounted transverse thrusters, DP2 dynamic positioning system, power electrical system, deck machinery, and the latest generation Acon automation and control system."

The owner has two more SOV's on order from at Astilleros Balenciaga, and two SOVs outfitted for commissioning of turbines (CSOVs) from the Astilleros Gondan yard, all for 2022 delivery.

Louis Dreyfus Armateurs, better known as a drybulk market stalwart, has also entered the SOV world with its 84m DP2 capable Wind of Change (designed by Salt Ship), delivered in 2019 from the Cemre yard in Turkey, and recently working at the Godewind project in the German North Sea. The vessel is outfitted with kit from ABB, using the Onboard DC Grid power distribution system. According to ABB, "Onboard DC Grid solution enables variable speed technology to dynamically optimize system energy use in line with the load situation, which results in a 20% cut in fuel consumption. Power from the dual batteries on board will be introduced to maximize efficiency, and the energy stored can come from a variety of sources, including renewables." Norwegian equipment supplier MacGregor Norway AS provides its Horizon motion compensated gangway and its Colibri motion compensated crane, on the Wind of Hope, a sister vessel. Wind of Change has the Colibri crane and a gangway from Uptime International.

Conversions

The European market has also seen conversions of existing OSV's to offshore wind service, with the addition of "walk to work" gangways, motion compensating cranes, and prefabricated accommodation blocks. The Norwegian owner Island Offshore, owner of four "walk to work" boats, has stressed flexibility; the vessels serve oil and gas platforms, but also act as SOV's for offshore wind. In describing its Island Diligence, delivered in 2018 from VARD Brevik, the company explains that the vessel was originally ordered as a platform supply vessel. But, with wind energy demand growing, they explain that it was "… rebuilt as an accommodation and offshore service vessel with the capacity to accommodate 100 persons on board, maritime crew included, and is equipped with a heave compensated and a 23 m telescopic gangway from Uptime. A



World Energy Reports

Louis Dreyfus Armateurs owned SOV Wind of Change

Cemre Shipyard

flexible offshore crane is also installed, adding lifting capacity and contributing to more flexibility in operations.

Maritime Reporter asked Daniel Holmes, Business Development Manager, North America, Marine & Offshore from Bureau Veritas (BV) about the feasibility of widescale conversions of underemployed offshore oil and gas service vessels for use in the wind trades. He was not overly optimistic. "In terms of conversion of OSV/PSVs one has to look at the wider market. Existing vessels that could be effective candidates for conversion are likely employed in their current mode; those vessels that are not currently employed will be those that are older, less efficient and generally would not easily fit the requirements described above." He also cautioned that "OSV/PSV conversions require a substantial rework of the structure, new systems, removal of tanks along with complete re-work of the forward accommodation. The required plan review and certification, in addition to the shipyard work, would likely not be an attractive proposition – despite the high cost of U.S. new construction."

Europe Scales Up Too

European owners have scaled up. In 2018, Østensjø had

"In terms of conversion of OSV/PSVs one has to look at the wider market. Existing vessels that could be effective candidates for conversion are likely employed in their current mode; those vessels that are not currently employed will be those that are older, less efficient ..."

– Daniel Holmes, BV

Bureau Veritas

Wärtsilä design for Jones Act compliant SOV

Wärtsilä

Wärtsilä

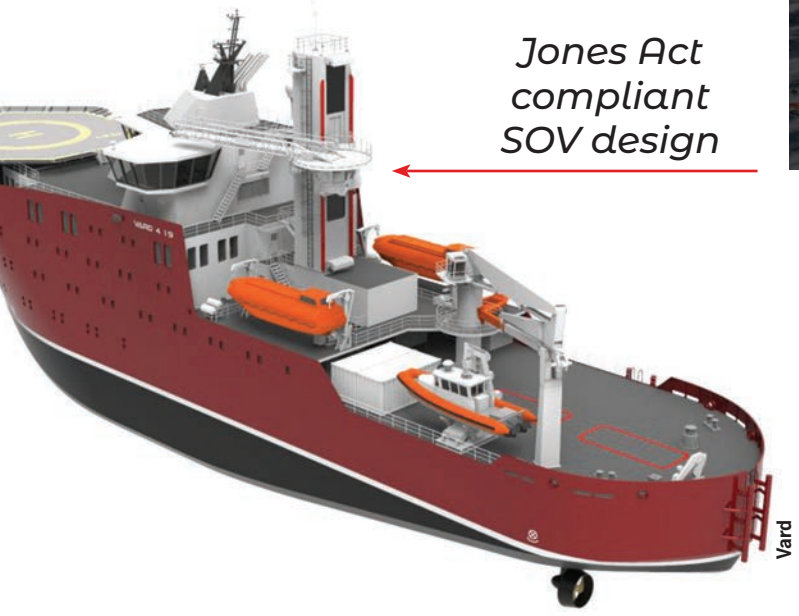
teamed up with shipowners Wilhelm Wilhelmsen to form Edda Wind, which is now set for an initial public offering of shares. In March, Edda Wind announced an order for two additional CSOVs from the Astilleros Gondan yard. At the beginning of January, the Norwegian stalwart Knutsen OAS explained that it was joining with two Norwegian utilities to form Deep Wind Offshore, a move which would service plots in the North Sea recently opened up by Norway. In March also, another Norwegian owner Awilco- announced that it, too, was joining the fray, with reports that its newly established Integrated Wind Solutions would be ordering crew transport and maintenance vessels.

One possible trend to emerge may be seen from CWind in the crew transfer sector. Its CWind Pioneer, launched in February 2021 from the U.K.'s Wight Shipyard, is a hybrid (diesel/ battery) powered "surface effect" vessel-with a hull form and air cushion system that enables speeds of 43.5 knots, nearly double the speed of typical CTVs. A CWind release says: "The high transit speed of the vessel also means windfarms previously serviceable only by an expensive SOV, can now be reached by the SES CTV within 60 minutes, giving wind farm owners and operators more low cost, low carbon options when determining their transfer strategy."

Potentially, a wider usage of higher speed CTV's might possibly reduce the need for larger accommodation spaces of SOVs. Such ideas should be taken seriously.

J.F. Lehman, a leading Private Equity (PE) investor in maritime service providers, has put its money behind CWind's parent company, Global Marine Group serving numerous offshore segments (including cable laying). BV's Holmes, in discussing the movement of turbines to deeper waters, along with the shift to floaters, offers another possibility, saying: "…with

Gondan



Vard

the acceleration of remote inspection by drones in the coming years could also see SOVs used as drone carriers."

SOV owners are also looking further into the future towards the transition to cleaner fuels. Østensjø Rederi had acted on "green" ambitions early on, "… working on developing new technologies based on hydrogen as a safe and efficient energy source." Its Spanish newbuilds "…are prepared for future installation of this novel technology, which will turn the vessels into zero emission vessels without compromising operational capabilities, i.e. they have endurance to operate on hydrogen throughout their operational cycles," according to vessel designer Salt Ship. Holmes presented a broad view:"What we see as a classification society is an increased demand for future-proofed designs showing a highly level of flexibility to adapt to future demands,not only in terms of alternative fuel but also how best to accommodate new technologies."

Image courtesy Crowley Maritime

Crowley, Esvagt Team on Offshore Wind

When Crowley dives into a market sector, the industry pays close attention. To that end, all eyes were on Crowley late last month when it announced a joint venture with Danish shipping company Esvagt.

By Greg Trauthwein

When Maritime Reporter TV interviewed Jeff Andreini, VP, New Energy Division, Crowley the week before the deal with Esvagt was announced, the 42-year veteran of Crowley, was eager to discuss the rising offshore wind market and its meaning not just for Crowley, but for the U.S. maritime industry as a whole.

It was Andreini's grandfather who helped him get his first job at Crowley, and in fact his grandfather was the longest-tenured Crowley employee ever, and the only one to work with all three generations of Crowley's. Andreini's experience with Crowley is broad based, and he has worked in nearly every division – from the administration to operations – and geographic local, from the west to the east coast, currently working out of Crowley's Houston office. To overstate the obvious, Andreini knows the Crowley brand and capabilities inside and out.

"(With offshore wind) there is an excellent opportunity for Crowley, and I think is an opportunity for a lot of different companies in the U.S. For us, offshore wind is in the wheelhouse of what Crowley is all about. We are a marine transportation and a logistics company, and at its core, this is what offshore wind is about as well."

Despite a number of stops and starts in offshore wind, the U.S. seems primed and firing on all cylinders to make the fledgling U.S. industry a global powerhouse by 2030, with broad and growing political, economic and industrial support, an evolution that could help to lift the maritime, offshore energy, subsea, port and logistics sectors for generations to come.

"It's the long-term play, not only for a company like ourselves, but I would say many different companies within," said Andreini. "We are moving into a new world, where, by 2040 to 2050, you're going to see a reduction to zero greenhouse gas emissions."

Preparing for the Job

While the opportunity is great, it does not come without challenges, and one of the chief challenges today is simply ensuring that there are enough physical maritime assets – from Wind Turbine Installation Vessels (WTIV) to Service Operation Vessels (SOV) to Crew Transfer Vessels (CTV) to ensure that there is an ability to install and maintain at pace, particularly as other world markets come online with offshore wind.

"There's not enough assets at this point and time. And I think a lot of people in the industry would tell you the same thing," said Andreini. "When we look at our feedering systems that we're offering up to the installers and the developers, and the amount of time they're going to need those barges, and just the cross section of all the different jobs that are going to be occurring at the same time, the assets are going to run dry very, very quickly. And not just the barges, you're going to need tugboats as well. In some cases, you might need two tugs for every feeder barge. So if you're talking about using our equipment as an example, we could be doing a wind farm for installation for roughly two years straight, with two barges, and potentially with four tugs."

While the specialty vessel construction challenges are one aspect, they are not alone in the list of hurdle. "I think that we should all should understand is the terminal infrastructure side," said Andreini.

"A lot of the marshaling facilities are being built up today. But still, there's a lot of green and brown field facilities that have been identified that still need to be dredged and built-in time to get going here by 2023. So the nation has a tremendous amount of work. Since the Biden Administration has taken over it's been like a tidal wave of information and requests that have come out over the last 50 days. And I anticipate that's going to continue in earnest over the next at least two years, if not longer."

Collaboration Required

Globally, the maritime industry faces a number of transcendent changes to its business model, from digitalization to autonomy to decarbonization; changes that will require collaboration for even the largest players to succeed.

For Crowley that meant announcing a a joint venture with Denmark's ESVAGT to build, own, and operate U.S.-flag SOVs.

"SOVs, in my opinion, next to wind installation vessels, are the most capital-intensive asset in the offshore wind industry," said Andreini. "This is a relationship that the company has been working on for months, and we are excited to share it with everyone, as it legitimizes that offshore wind is for real."

Consistent with the requirements of the U.S. Jones Act, Crowley will own and operate the vessels with its U.S.

L to R: Søren Karas, CCO and Peter Lytzen CEO, Esvagt.

mariners, while Crowley and ESVAGT will share in the economics of the venture. ESVAGT is the leading Service Operation Vessel (SOV) operator in Europe and will provide technical advice on the design, construction, and operation of these vessels based solidly on their past performance with this specific vessel type. The venture will work to develop a best-in-class design and deliver its first wind-dedicated, U.S flag SOV. This deal comes on the heels of another partnership between Crowley and Watco to serve this fast growing market, a partnership designed to fast track the logistics of offshore wind, as Watco is heavily engaged in the onshore wind business and runs its massive 'Green Ports' facility in Houston, a facility which handles a variety of project cargo but is dominated by work supporting onshore wind.

"Watco brings strong experience in terminal management, and even though it's onshore wind, I believe it's transferrable to the offshore side as well," said Andreini.

Image above courtesy Esvagt; Images below and right courtesy Crowley Maritime

"Since the Biden Administration has taken over it's been like a tidal wave of information and requests that have come out over the last 50 days. And I anticipate that's going to continue in earnest over the next at least two years, if not longer."

Jeff Andreini, VP, New Energy Division, Crowley

MARITIME REPORTER TV **Watch the full interview with Jeff Andreinion MR TV: bit.ly/3dkSpHQ**

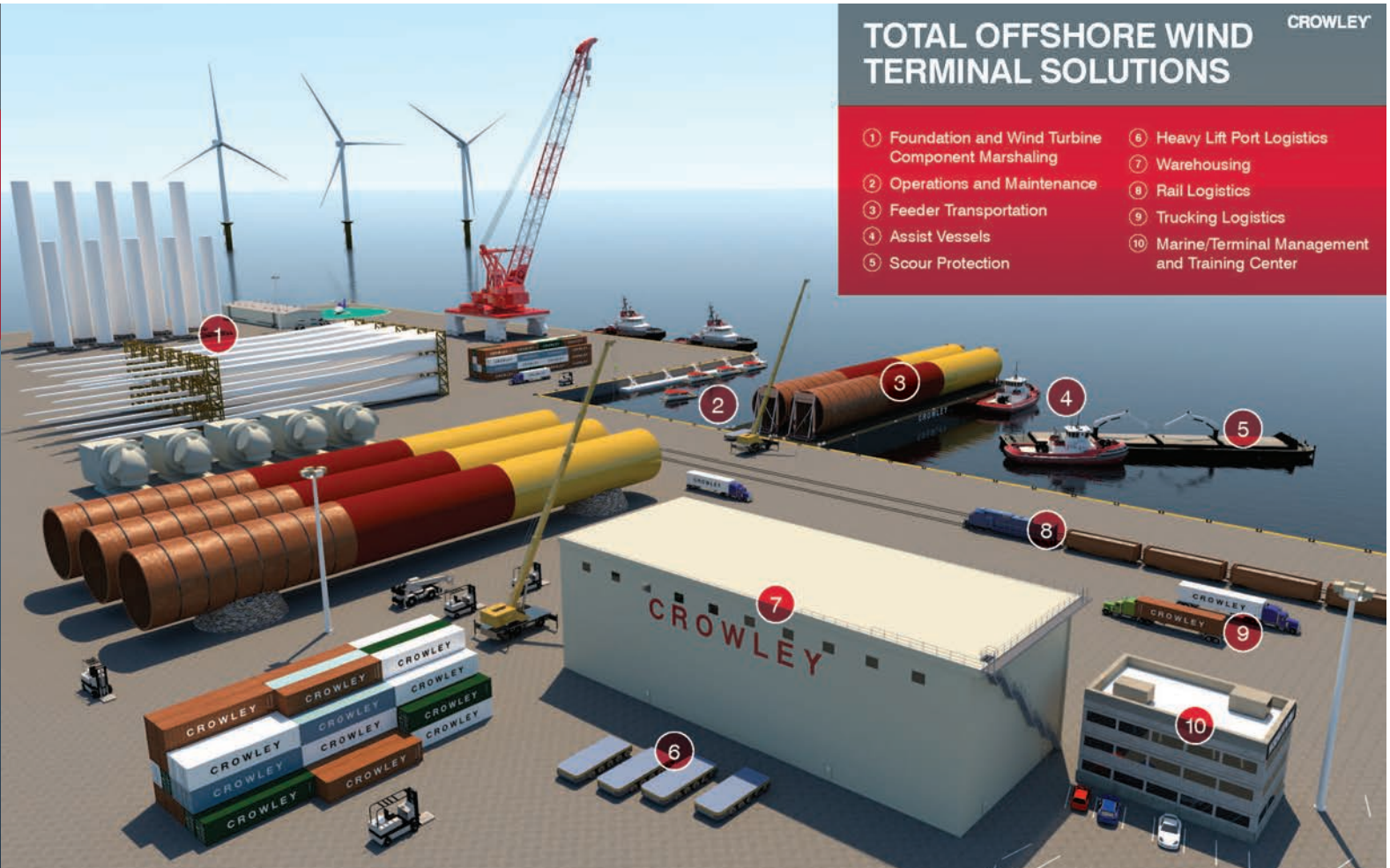


Photo courtesy Scania USA

Scania Quad Power for WindServe Odyssey

By Greg Trauthwein

WindServe Marine, the offshore wind division of the Reinauer Group of companies, recently completed construction of the purpose-built crew transfer vessel from its SENESCO Shipbuilding facility in Rhode Island, a 64.5 ft. aluminum high speed catamaran which is "typical for crew transfer vessels that are operated in a Europe," said Josh Diedrich, Managing Director of WindServe Marine. For power the boat features four Scania engines – the Scania Quad Power Solution – driving Hamilton Jets.

"Based on our project requirements, we knew that we had to provide a quad propulsion vessel for redundancy and client needs," said Diedrich. "We knew we needed high-end, high-speed engines that met our engine tier requirements, our horsepower requirements and also had a really good power to weight ratio."

According to Diedrich the Scania solution checked all of those boxes, and more. "A big thing for us, is we want to make sure that the parts and service network is there, and it's going to be there where we need it. Operating on the East Coast, we vetted the Scania network for service dealerships and distributors, and made sure that on the East Coast, they were able to provide us with the service and parts we need."

Most routine maintenance and repairs will be done by the WindServe crew, "but if there's an emergency and we need a spare part that we don't have in stock, or we need a service technician to troubleshoot that's outside of our crew's range of competence, we needed to make sure we had a good service network," said Diedrich. He said Scania has set up a very good network on the East Coast, a network that can not only lend technical support but access to spare parts within 12 to 24 hours.

The Scania Quad Power Solution

Scania is not a new name in offshore wind power business, having cut its teeth in the demanding and mature European offshore wind sector. The 4 x Scania DI16, 800-hp V8 engines set up in the WindServe Odyssey are constructed of compacted graphite iron (CGI) material, which according to Al Alcalá, sales manager, marine, Scania U.S.A. provides both strength

"Based on our project requirements, we knew that we had to provide a quad propulsion vessel for redundancy. We knew we needed high-end, high-speed engines that met our engine tier requirements, our horsepower requirements and also had a really good power to weight ratio."

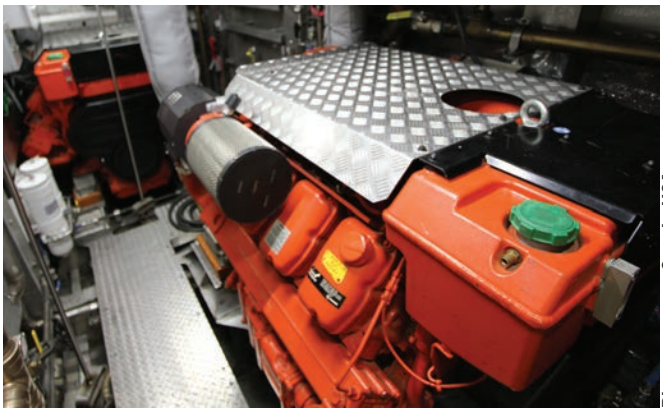


Photo courtesy Scania USA

Josh Diedrich, Managing Director, WindServe Marine, discussing the choice of the Scania Quad Power Solution.

for durability and light weight for speed performance and fuel savings. "Because (the engines are) compliant with EPA Tier three emissions, you don't need after treatment, and that saves weight, too," said Alcalá. "We can provide the flexibility with multiple engines, save weight overall on the design, and have a very strong, robust, reliable product."

As with any engineered product, maintenance and support is at the forefront to keep operations running. The Scania engines are designed from the start with ease of maintenance in mind, particularly enabling the end user to conduct routine maintenance with ease. "Customers are able to do a lot of the work on their own," said Alcalá. "Even our own process, what we call our Scania Smart Support, relies a lot on one service technician being able to do anything to maintain or repair this engine. For example individual cylinder heads weigh only 40 pounds each, so you don't need an A-frame inside the vessel to take a head off. At 800 horsepower and 3,800 pounds, these engines are very power dense."

WindServe Odyssey Machinery

Main Engines:	4 x Scania DI16 - 800 HP
Generators:	2 x Kohler Marine - 32 HP
Propulsion:	4 x Hamilton HM461 Waterjets
Control System:	AVX with JETanchor Station Keeping
Vessel Monitoring:	Reygar BAREFleet
Forward Deck Crane:	Palfinger 12000 PK
Bow Thrusters:	2 x Sidepower - 20 Hp / 15 kW Each
Anchor Windlass:	Hercules AAW90 (Starboard Bow)
High Pressure Washer:	Hercules, Fixed on Port Bow Area
Bow Fender:	RG Seasight
Stern A-Frame:	2.65 Tons Capacity
Offshore Fuel Transfer:	40 Meter Fuel Transfer Hose Reel Located on the Bow
CCTV:	Camera Coverage of All Work Areas
Entertainment:	DirecTV Satellite Television
Internet:	KVH Fleet One VSAT
Seats:	KPM Suspension Seating

Photo: Wärtsilä Voyage

Autonomy is a Journey

Wärtsilä Voyage Helps to Define and Drive Maritime's Automated Future

As the maritime industry faces numerous environmental and efficiency challenges, the future is ship automation and Wärtsilä Voyage is a driver. Sean Fernback, President, and Thomas Pedersen, Director, Automation & Dynamic Positioning, Wärtsilä Voyage discuss the path and the pace

By Greg Trauthwein

Sean, it seems many define "autonomy" differently. How do you define Wärtsilä's smart-autonomy approach?

Sean Fernback, President, Wärtsilä Voyage: Autonomy is a journey and there is no question that, at some point, various vessels in different classes will be fully autonomous. The question is; which vessels will be first? Will they be coastal? Will they be tugs? We don't know. What is required to deliver a fully autonomous vessel is hugely complex. When you look at the existing fleet in maritime, you're looking in technology in an order of magnitude that is almost incomprehensible to the technology we have on vessels today. So today most vessels will have navigation, sensors, sonar, weather and comms, that sort of thing. Autonomy is about delivering a set of solutions where ultimately the sum total of those solutions will deliver a fully autonomous vessel.

A common theme we hear is that ship owners are not driving it (autonomy), the technology companies are driving it. What's your perspective?

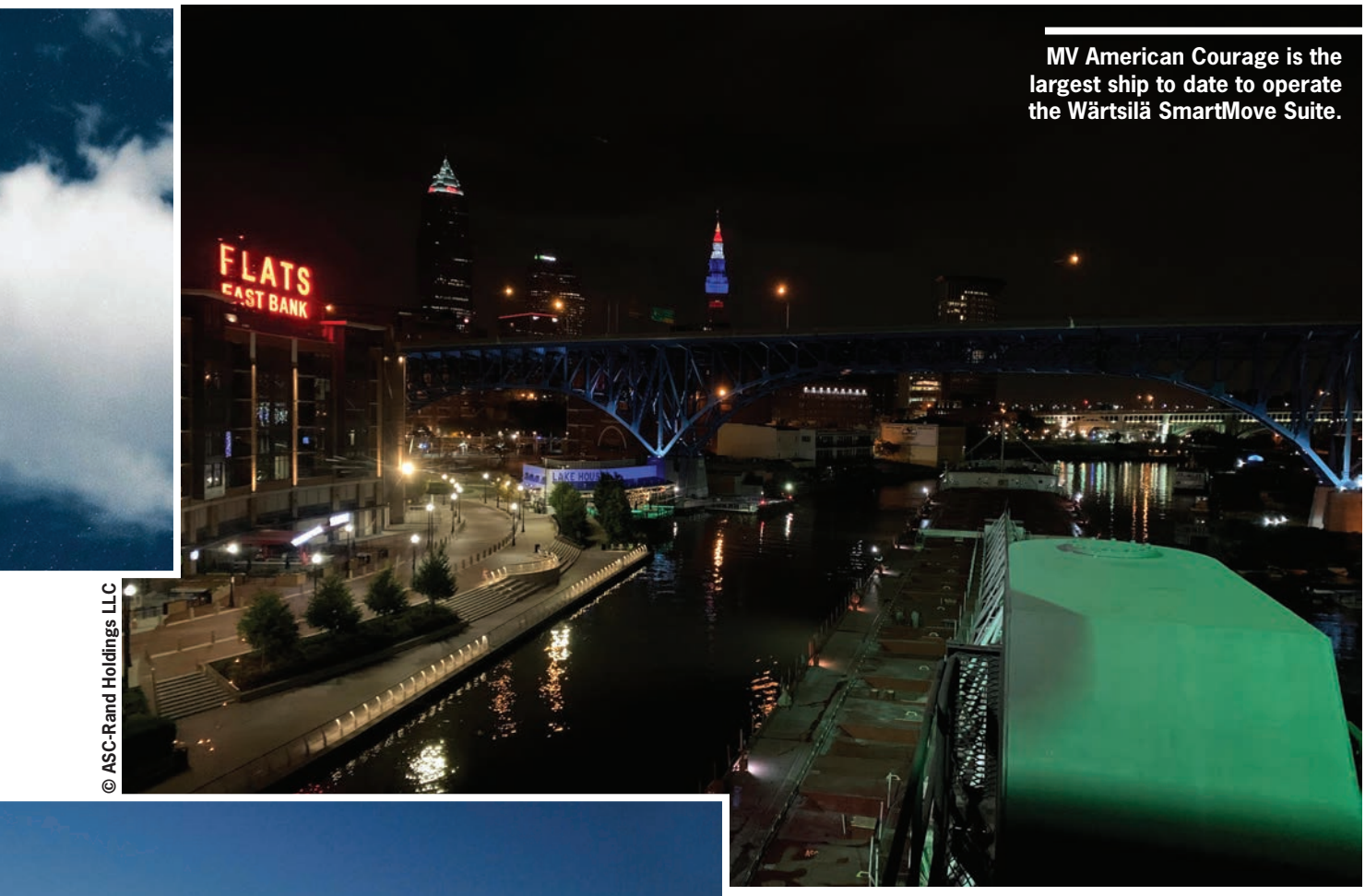
Thomas Pedersen, Director, Automation & Dynamic Positioning, Wärtsilä Voyage: I hope not! We try to look a little bit less at 'autonomous ships,' and more at automating the operations of a ship. That same ship can have different operational profiles depending on what the ship owner is using it for, and some of those operational profiles will lend themselves much better to be automated.

Obviously there are a wide range of vessels and operating profiles. Which ones lend themselves best to automation and autonomy?

Pedersen: The most obvious example is a ship going between two ports, very short transit time in an area where there's no risk of collision with anything else. That would be the simplest operational profile to automate and it would make sense to automate more of the task being done on such a ship than ships operating in more complicated environments. Everything we do, everything we develop, we develop together with customers. We strive to find customers that have challenges in the current operations, (and we) can help by offering some level of automation or advanced decision support systems.

Wärtsilä made the news recently with the American Steamship Company, the first to install the Wärtsilä smart move solutions for hands-off transit along the Cuyahoga River in Ohio. Can you tell us a bit more about the contract and its significance to Wärtsilä Voyage?

Pedersen: It's the first company to install this that we can talk about. It's an interesting case in many different ways. It



MV American Courage is the largest ship to date to operate the Wärtsilä SmartMove Suite.

started as an open discussion with ASC, understanding their operations and then finding common ground (with our offerings). So we are delivering a system that is able to automatically control the physical movement on the ship when going from A to B. This is not meant to replace the crew, it's meant as something to enable the crew to focus on all of the other tasks that are related to navigating.

What we deliver is a system with the technology built on top of a dynamic positioning system with some changes to the software, because this is a completely different task than that of a normal DP system.

What's the first step on a project like this?

Pedersen: There are a lot of things going on before there's even a contract. There has to be a lot of understanding of the ship's operational profile. Does it lend itself to use the capabilities we have? And if we assume that these things fall into place, then the first thing that will have to happen is the physical installation of the system on board. One the key efforts is to first make sure that there is a proper integration between our system and the propulsion system on the vessel. When that is done, we start tuning the system and doing some dry runs via simulation (simulation on the specific routes the vessel normally sails).

Looking 'bigger picture,' is the integration of this type of tech solution all or nothing, or is it a step process for those owners not ready to go all in?

Fernback: It is definitely a step process, (which is why) we see autonomy as a journey. I think the other thing that one has to take into consideration is the affordability. Wärtsilä is really trying to pull its central gravity more towards the decarbonization agenda, so we want to underpin that with activities and solutions that can help the various vessels move towards emission reduction. I think autonomy is just one of those things. Less so perhaps on emissions, but much more on

MARITIME REPORTER TV **Watch the interview on MR TV @: bit.ly/3rvJiZZ**

Sean Fernback **Thomas Pedersen**

reducing operational costs in terms of crew reduction.

So it's definitely a step process, and I had some experience in the automotive industry and I think it's a good example to follow. They created five levels of autonomy, and I think we're at three now, level three is all proven. These things are complex and costly to develop, they take time, and they need to be delivered with very high standard of quality and safety, of course, which is number one. So it is a step journey.

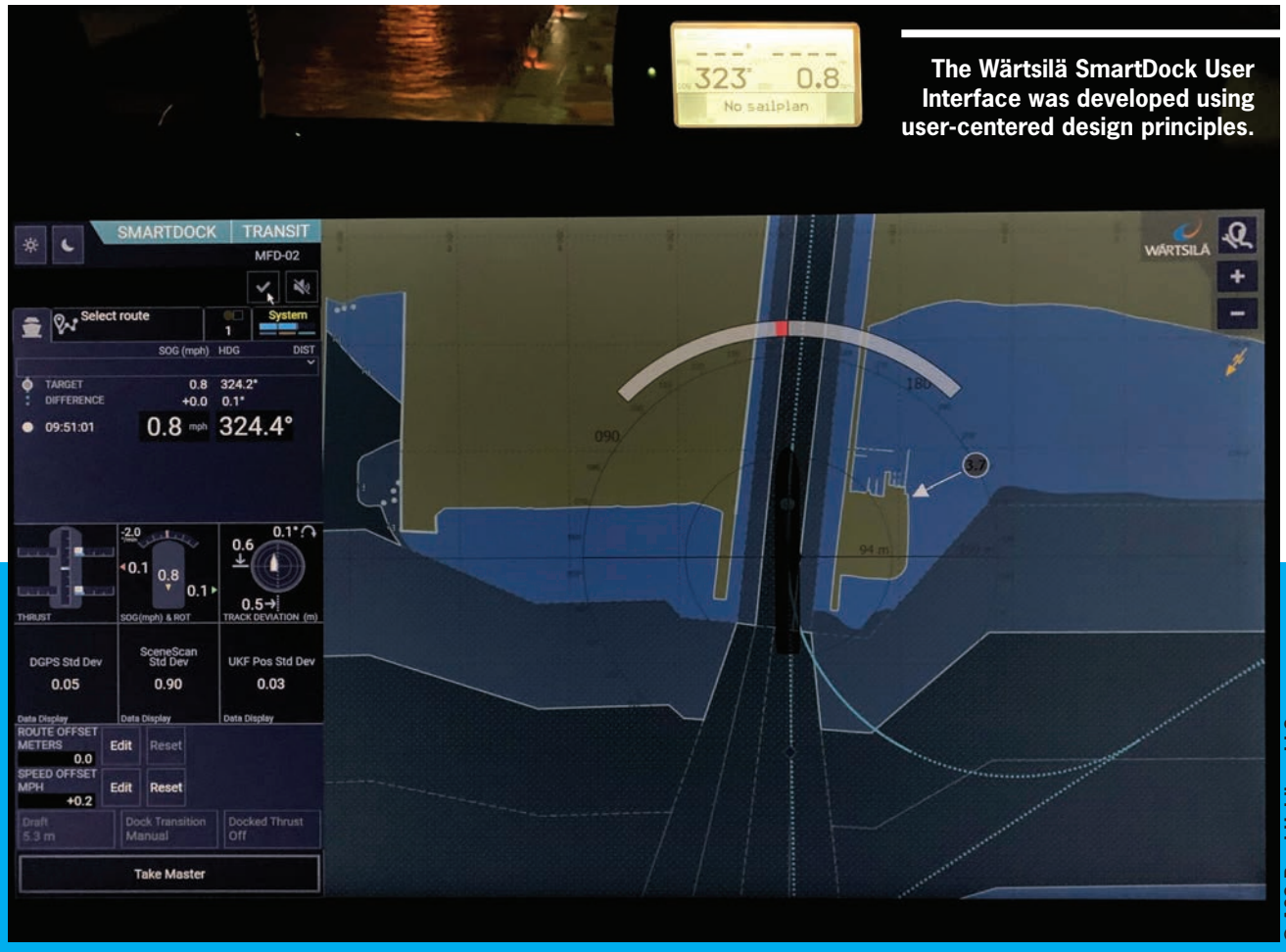
Looking at the issue, bigger picture again, can you put in perspective the importance of this whole smart autonomy to Wärtsilä as a company?

Fernback: It's very important and it's definitely the way the industry will move. The question is how quickly and how much of a part can we play in the speed of that paradigm shift? I think the smart move program as Thomas described was typically what we call proof of concept. It's something we did very specifically for one customer to prove out the learnings of the technology and the operations, and also hear what the customer has to say.

The autonomy program is really important. Thomas heads our 'On Vessel Product Group' and he has three big departments within that group in terms of managing the portfolio: automation, navigation and autonomy. So all the autonomy investments and the programs that we have in place, as well as the programs we will develop in the future will sit within Thomas' group.

Can you put perspective the amount invested in R&D, with insights on what to expect from Wärtsilä Voyage in the coming 12 to 24 months?

Fernback: I think the one word I would use Greg is "substantial." Voyage is the pathfinder for Wärtsilä in terms of taking it through this digitalization process. We're very well supported by the board of management and the board of directors. We're not a mature business, and our numbers reflect it because we are a composite of many acquisitions that have been made over the last six years that are now really coming together. So they've invested north of half a billion (dollars) on acquisitions because they see this as the future. (Our job is) to put all of that to good use, creating a portfolio of products and services and solutions of the future. Then we start to drive not only the industry, but also ourselves, to drive some profitability into the business.



The Wärtsilä SmartDock User Interface was developed using user-centered design principles.

© ASC-Rand Holdings LLC

American Steamship Installs Wärtsilä SmartMove

Wärtsilä Voyage introduced Wärtsilä SmartMove Suite, its flagship offering for semi-autonomous sailing that features advanced sensors and high-accuracy ship control systems, effectively taking the concept of automated dock-to-dock operations to the next level. Fully retrofittable, the SmartMove Suite can soup-up existing vessels with next-generation capabilities to improve safety, efficiency and productivity. The first order was placed by American Steamship Company (ASC), a subsidiary of Rand-ASC Holdings LLC, and has been installed on the MV American Courage, a 194m Great Lakes self-unloading bulk freighter with a cargo carrying capacity of 24,300 gt. Apart from its size, the ships area of operations – the winding, often narrowing and sometimes congested Cuyahoga River in northern Ohio – created a many challenges, and the Wärtsilä solution successfully passed the test, operating on the American Courage since March 2020. For the project Wärtsilä Voyage provides a standard hardware setup with redundant controllers and displays, along with a sensor suite (comprising gyro, MRU, wind, and GNSS sensors). This is connected to a single digital platform through which five software products are available: SmartDock, SmartTransit, SmartEntry, SmartPredict, and SmartDrive. The core blocks of software (including controllers, sensor processing, Thruster Allocation Logic and track follow) are sourced from Wärtsilä Voyage's Dynamic Positioning portfolio, which has been in use over many years in some of the world's harshest environments.

The Electronic Lookout

Evidence mounts that vessel safety will benefit with technology enhancing the bridge lookout.

Photo: ABB

By Dr. Kalevi Tervo, Corporate Executive Engineer and Global Program Manager & Capt. Eero Lehtovaara, Head of Regulatory Affairs, ABB Marine & Ports

Maritime safety regulations have – and for valid reasons – traditionally been strict and have often developed in ways that could hold up innovation. Almost two decades after the remedy of 'goal-based' standards and 'technical equivalence' arrived at the IMO, rules based on risk assessment and functionality continue to face an uphill battle to redefine a safety culture based on 'dos and don'ts'. The use of predictive algorithms to automate or semi-automate aspects of ship operations is already accepted as a way of enhancing safety, as well as operational efficiency. Dynamic Positioning, for example, has become a mainstream vessel control technology whose advancing capability not only responds to but anticipates conditions, based on accumulated data. Predictive algorithms are now also being used to enhance safety in other areas of ship control, including maneuvering, trim optimization and braking. However, regulatory red flags are raised when the same logic is applied to the 3D visualization and situational awareness techniques that can 'see' better than human beings and, using accumulated data, assess the situation with greater consistency.

Lawmakers say that automation should only be favored over the human alternative if safety is "equal or better". However, establishing the basis for the comparison is no easy matter. The conventions on Safety of Life at Sea (SOLAS), Standards of Training, Certification and Watchkeeping (STCW) and Regulations for Preventing Collisions at Sea (COLREG) are descriptive when explaining the relationship between bridge crew and ship. Human performance varies by individual but also by health, alertness and mood, time of day and conditions. One area where the "equal or better" formula may be tipping in favor of automation covers the role of lookout. As the purpose of the navigation rules is to prevent collisions, it follows that the purpose of the lookout is to ensure the safety of the ship and any other vessels in the vicinity by relaying information to the officer of the watch in an orderly fashion with the best possible accuracy.

Modern SOLAS ships have mandatory navigational equipment for assisting in determining the position, heading and detecting the relevant obstacles in the surroundings. In practice, the vessels typically have radar, gyrocompass, ECDIS, GNSS-based positioning system and an AIS receiver. In addition to these devices, the lookout uses his or her own senses, mainly eyes and ears to perceive the surroundings.

Human eyesight performance depends on the eye health and clarity of vision, but also light and obstacles (such as fog) in the line of sight. Eyesight, hearing and other faculties are actually considered quantifiable using STCW conventions, but variations in human performance are inevitable – no matter how vigilant. Even setting aside individual strengths and weaknesses, external factors limit the ability of any human lookout to detect targets from the bridge. When visibility is considered 'perfect', the cur-

vature of the Earth limits the maximum range of human vision, for example.

If this observation appears to be of hair-splitting proportions, it should be noted that a lookout with 'perfect' vision positioned at a height of 30 meters would not be able to see another 30-meter high structure at all if it were 39.1 km away. However, the vision of a real lookout would not be perfect: based on the minimum eyesight requirement for deck officers, the minimum angular resolution of a human lookout is 2 'arcminute'. The same 30-meter high observer would actually only see a structure of the same height at a distance of 31.7 km. In real conditions, the lookout's visibility is also influenced by fog, haze, rain, smoke, etc. The range of visibility will therefore depend not only on light conditions, but on the properties of the target. For some, these limitations and areas of uncertainty are simply part and parcel of the real world. Furthermore, camera performance is also affected by the real world - by air quality, humidity, vapor, light conditions, contrast, color and the reflectivity of the object. Again, lens quality and focus can vary, while mechanical vibration may also compromise performance.

Digital and connected real world

However, in the real world where ships operate today, the SOLAS navigational aid equipment with which humans interact is already digital. Looked at from the functional, rather than human perspective, the lookout performs the 'sensor fusion' of combining visual, radar, chart inputs, then offers an overall 'manual' assessment of the situation.

To achieve the same level of performance with a machine-based lookout, it is first vital to prove that computer vision can achieve adequate level of performance at the boundary conditions. Therefore, the main tasks to demonstrate equivalency by means of visual technology are: **[1]** Detection of a target of which minimum projected dimension extends 2 arcminutes above the horizon in good visibility conditions; **[2]** Detection of target of which minimum projected dimension extends more than 2 arcminutes in the field of view at the visibility range in decreased visibility conditions; **[3]** Detection of a target in front of the horizon that extends 2 arcminutes in the minimum projected dimension in good visibility conditions

If the above can be demonstrated, the minimum level of a lookout – that is, detecting the targets – could be shown to be 'as good or better' than the human.

Trials and learnings

In order to verify theoretical assertions, a camera-operated awareness system was tested around Helsinki archipelago, using a set up that worked with a full HD PTZ-camera and 30x optical zoom. The horizontal field-of-view of the camera with maximum zoom settings is 2.3°, with the camera installed at a height of 10 meters. The vessel where the camera was mounted was stationary during the experiment.

Two pleasure crafts described were used as detected targets. The boats were navigated to a specific distance from the vessel where the camera was mounted. The weather was clear, with 4 m/s wind from north east. The air pressure was 1019 hPA and visibility was good. The time of day during the experiment was 04:00 am to 06:00 am. Using the conventional approach, it would be expected that the 'Small pleasure craft' would be detected at around 5.8 km. However, using the new set-up, the boat was still detectable at 6.8 km.

In sum, **Table 1** shows the camera-based detection distances for various marine-relevant targets and compares them to the estimated detection distances of a human lookout. It offers a detailed account of the way the camera setup can achieve the equal or better performance than the human eye in visibility conditions that are given as good.

Modern perception technologies also achieve performance beyond human perception capabilities for other reasons. For example, infrared (IR) camera technology can detect targets in decreased visibility conditions that a human with binoculars cannot.

Short wave infrared (SWIR) cameras enable detecting other vessels even through fog and long wave infrared (LWIR) cameras enable detecting other vessels, debris and floating obstacles even in pitch black conditions.

It is important to acknowledge that these high-end technologies come with costs attached, meaning that any claim to be 'better than a human' should be weighed up from the financial as well as the practical standpoint. In doing so, however, it is worth considering that automated advantages are cumulative: the human lookout needs to process, remember and track targets detected visually and reconcile this information with that coming from the AIS and ARPA radar.

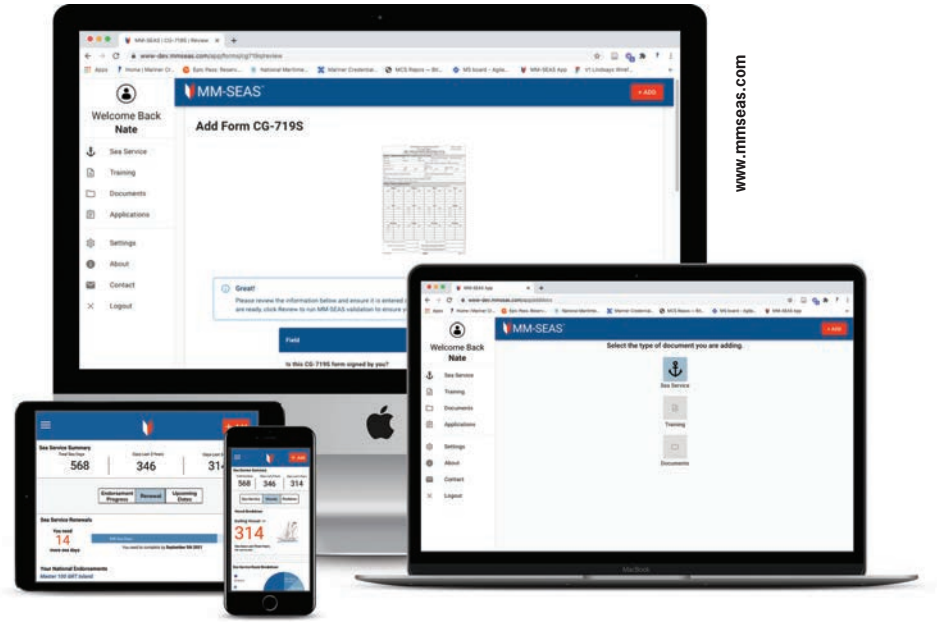
Table 1: Comparison of range, human lookout v. HD Pan-Tilt-Zoom (PTZ) camera with resolution of 1920 x 1080 and zoom, installed at 10 m height

	Size of object			Detection distance – Camera (km)	Detection distance – human look-out with STCW 2010 req.	
	Length (m)	Height (m)	Beam (m)		<2° off-center (km)	30° off-center (km)
Small boat	4.7	1.0	1.5	3.8	1.7	0.1
Small pleasure craft	7.0	1.5	2.6	5.7	2.6	0.2
Small pleasure craft	10.2	3.0	3.5	11.4	5.2	0.3
Small passen-ger ferry	33.0	6.0	8.0	16.1	10.3	0.6
Bunkering vessel	87.8	26.6	13.4	27.1	24.0	2.9
RoPax vessel	136.1	30.0	24.2	28.3	25.3	3.2
Medium range tanker	205.7	30.5	34.3	28.4	25.4	3.3
Aframax	246.9	33.5	41.1	29.4	26.5	3.6
Suezmax	289.6	45.7	48.3	33.0	30.2	4.9
VLCC	378.0	61.0	63.0	36.9	34.2	6.5

Tech Files

Innovative products, technologies and concepts

Software Helps Mariners with USCG Credentials



MM-SEAS (www.mmseas.com) is reportedly the first software that automates the manual task of obtaining, tracking and renewing U.S. Coast Guard (USCG) credentials, helping to eliminate paperwork processing errors while delivering merchant mariner career guidance.

Civilian mariners are required to have valid USCG Merchant Mariner Credentials (MMC) to be onboard any commercial or federal ship in the United States. Credentialing is a complex and vague process. From 2012 to 2018, 44.9 percent of approximately 500,000 applications submitted to the USCG National Maritime Center were incomplete or missing key documents.

"I've been sailing my whole life, and as a captain, I knew how hard it was for me to obtain and grow my credentials. I first thought of MM-SEAS because I started to help other mariners apply for their endorsements," said Nate Gilman, Co-Founder and President of MM-SEAS. "Applying for a credential is like doing your taxes by reading the federal code! We wanted a simple way for mariners to grow in their careers, and for our military community to have good paying jobs after they leave the service. The team started MM-SEAS to support and grow mariners to fill these really critical roles."

mmseas.com

Boskalis Marine Services Sail With AutoLoad Onboard Stability Software

Autoship Systems Corporation (ASC) in cooperation with its UK & Norwegian resellers supply Boskalis Marine Services (Boskalis) with ASC's onboard stability software, Autoload. Boskalis, a Dutch dredging contractor with operations in 90 countries and more than 650 vessels and floating equipment, has installed more than 20 licenses of Autoload onboard its Anchor Handling Tugs and Offshore Construction Vessels. Boskalis uses Autoload to satisfy its class needs for approved Type 2 and Type 3 loading instrument software. Autoload is used at all stages of vessel operations. The program reads data from tank, draft, wind and SCR sensors as well as user-input and then reports on the stability and strength status of the vessel. Autoload is often used in conjunction with ASC-developed load planning modules specific to a vessel type, eg. supply, jack-up, bulk, RoRo, rig, etc. Ashore, the load planning modules are interfaced with the in-house booking systems and are used to create load plans which are then transmitted to the vessel, thus allowing more optimal loading in shorter time.

autoship.com

Ship Repair

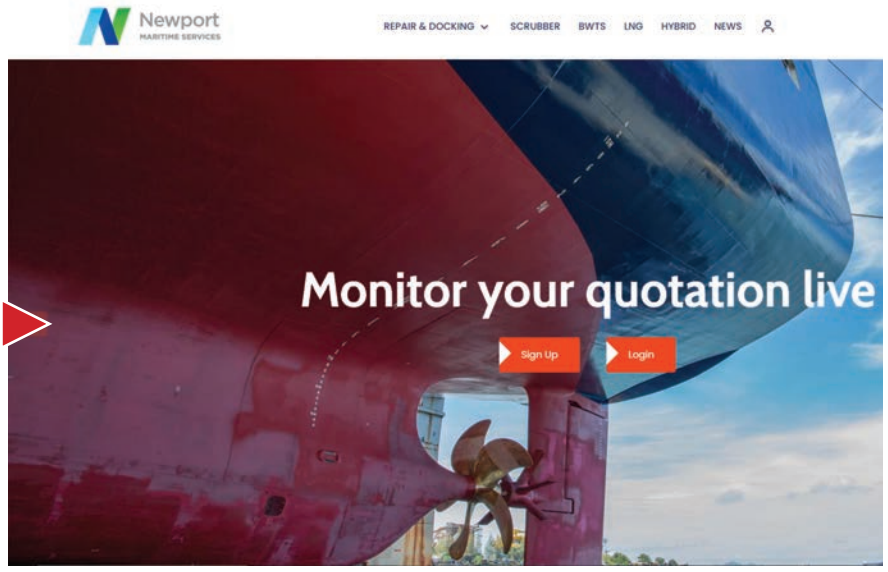
Goes Digital

Earlier this year Newport Shipping unveiled what it is calls a "first of kind, innovative online portal" that was designed to ease the complexities of ship repair and retrofit works by leveraging the power of digitalization.

As presented the NMS platform enables shipowners and fleet operators to obtain instant quotes for routine maintenance works, have real-time visibility of shipyard availability and get priority access to dry dock slots, all at the click of a mouse. Subscribers to the NMS platform will have access to instant quotations for a wide range of routine maintenance and repair works, as well as the ability to book slots at a shipyard of their choice with a real-time view on the yard's current availability. The platform will also provide access to a full set of bespoke solutions in repair, retrofit and conversions with a low carbon focus from a list of trusted Newport Shipping supplier partners. The introduction of this digital tool also stands to support the industry with its Environmental, Social and Governance (ESG) mandate. Audit trails, data points, real-time information and the transparency that comes with further digitalization is designed to serve to help the ship repair and conversion sector clearly communicate.

Newport Maritime Services (NMS) is an online quotation and booking platform for the ship repair, conversion and retrofit markets. NMS cooperates with a network of 12 shipyards with 28 docks capable of handling all vessel types and sizes with approximately 2100 dockings annually across the Atlantic and Pacific trading zones through its parent company Newport Shipping

newportmaritimeservices.com



Newport Maritime Services

In the Shipyard

New vessels, contracts and designs

OHT

OHT's Alfa Lift at CMHI shipyard in China.

Senesco

The Janice Ann Reinauer is a "Tier 4" ATB Tug.

Prysmian

Cable Layer Leonardo da Vinci

Alfa Lift Launched in China

OHT's new build vessel Alfa Lift has been floated-out from its dry dock at China Merchants Heavy Industry (CMHI) shipyard in Jiangsu, China. The heavy installation vessel is designed and built for installing the next generation XXL offshore wind foundations. Key elements of Alfa Lift's major crane components have been completed in Rostock, Germany. The heavy lift crane's slewing column and the A-frame are scheduled to leave Rostock in early March and will arrive in China in April where they will be installed.

"The vessel construction has progressed well despite these challenging times," said Bjarne Birkeland, Head of Vessel Management for OHT. "We are also grateful for seeing the Liebherr 3000 tonne heavy Lift crane components being shipped from Liebherr's facilities and look forward to seeing the crane installed on the vessel." Alfa Lift is on schedule for delivery at the end of this year or early 2022.

Senesco Delivers "Tier 4" ATB Tug

Senesco Marine has built and delivered another EPA Tier 4 compliant ATB Tug, Janice Ann Reinauer to Reinauer Transportation. The 4,200-hp tug was designed by Ocean Tug & Barge in cooperation with The Reinauer operations team and is the 13th tug Senesco has built for Reinauer. The tug was designed to operate as an articulated tug-barge unit (ATB) with an Intercon coupling system. The Janice Ann is classed by ABS (A1, Towing Vessel, AMS), certified to USCG Sub-Chapter M requirements and is fully SOLAS and ISM compliant. The tug's main propulsion system consists of two (2) GE 6L250, EPA Tier 4 diesel engines, Lufkin reduction gears and Nautican Integrated Propulsion Units including high efficiency nozzles, triple rudders, pre-swirl stators and propellers. The electrical power plant consists of John Deere ship's service generators including an emergency back-up generator.

Cable Layer Leonardo da Vinci

Leonardo da Vinci, built by the Vard shipyard in Brattvåg, Norway, for the Prysmian Group, is scheduled for delivery in the second half of 2021. The new Prysmian flagship will be managed by Sea World Management of Monte Carlo, which already takes care of the management of the three other cable-laying vessels of the Prysmian Group engaged in different areas of the world. When completed Leonardo da Vinci will be able to lay cables up to 3000 meters depth. This ship is equipped with two rotating platforms with capacities of 10,000 and 7,000 tons. The ship is the first to be equipped with the retractable thrusters of the Wärtsilä WST-24R designed to ensure maximum stability during cable-laying operations and minimizing the use of space on board.

MS Servio: Joint Serbia, Netherlands Build

The 110 by 11.45-meter inland river tanker MS Servio was

fabricated at the Shipyard Kladovo in Serbia for her Dutch owner Larosare B.V.. On completion of the hull, cargo piping, and superstructure, the boat was towed up the Danube, over the continental divide, down the Mains and Rhine to the Netherlands for fitting out at Ooninxs in Wekendam. The most significant part of the work done in the Netherlands was the installation of the engines. A Cummins QSK38M1 main, generating 1400 hp at 1800 RPM provides main propulsion power. This engine, a favourite among inland boats in Europe, assures the power and reliability expected of a tank ship. The main turns a 1.75-meter propeller through Masson Mw W5200 gears with 5.91:1 ratio. This gives a prop rotation of 302 rpm.

CSD Delivered To Suez Canal Authority

Royal IHC officially deliverd the cutter suction dredger (CSD) Mohab Mameesh to the Suez Canal Authority (SCA) on March 18. With the delivery of the 29,190kW heavy-duty rock CSD, SCA now owns one of the most powerful dredgers in the world. With an overall length of 147.4 metres and a total installed cutter power of 4,800kW, it can dredge to a depth of 35 metres.

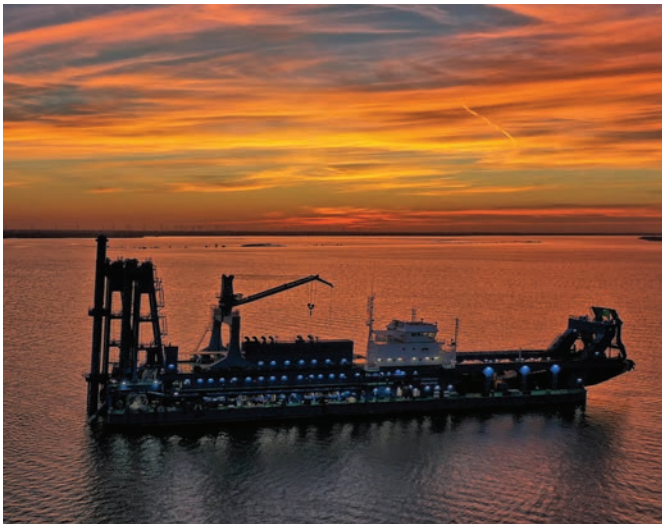
ClassNK RMSV for K-Line LNG Car Carrier

ClassNK has granted its Remote Survey (RMSV) notation for Century Highway Green, an LNG-fueled PCC operated by Kawasaki Kisen Kaisha, Ltd. (K-Line). This is the first vessel on ClassNK's registry to be marked with RMSV notation at the time of delivery. On its site, K-Line strengthened the infrastructure for onboard and ship-to-land communication beyond that of conventional ships, including:

• Expansion of on-board Wi-Fi to living quarters, cargo deck engine room and LNG fuel-related equipment compartment;
• Introduction of wireless communication equipment supporting explosion-proof areas; and
• Introduction of 4G/LTE.

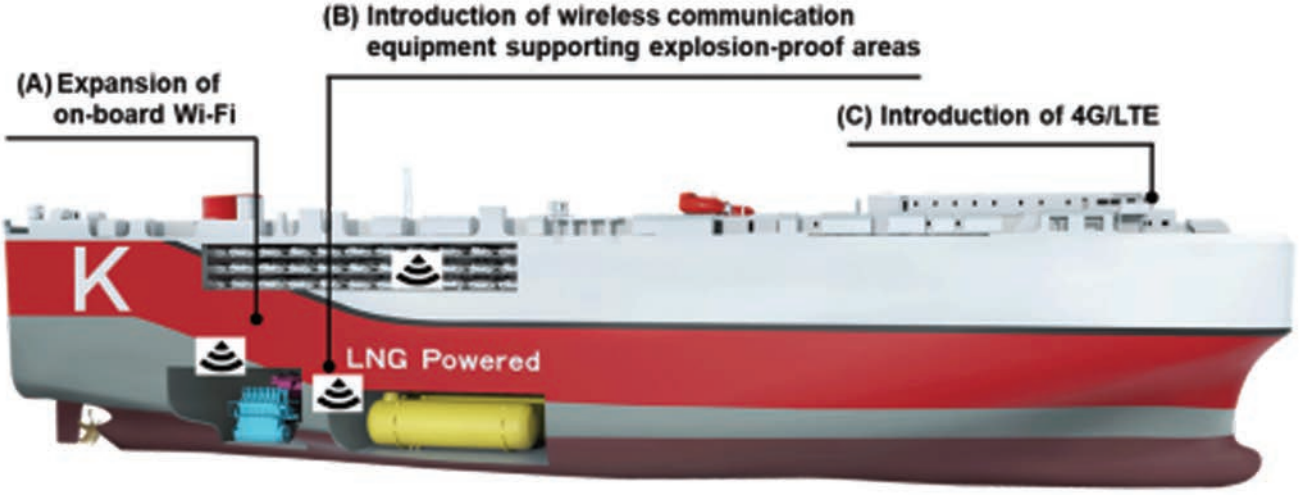
Photo: Maritime Filming Group/https://maritimefilminggroup.com/nl/home/

MS Servio



Copyright: Peter de Klerk

CSD Mohab Mameesh



K-Line

Wilhelmsen's Global Management Team

Wilhelmsen

Wilhelmsen Goes Big on Renewables

Wilhelmsen has redesigned its organization of group portfolio to intensify the growth of maritime services and renewable energy and decarbonization. "Our strategy is very clear, we will contribute to the energy infrastructure transition and be an active player in decarbonisation," said **Thomas Wilhelmsen**, group CEO. "In addition to accelerating the transition of our existing businesses, we will invest in new businesses with the long-term aim of shifting from mainly oil and gas related activities to mainly activities related to the renewable sector. We foresee up to $500 million in new business investments related to the renewable segments over the next five years and expect to invest on our own, together with partners, and/or utilize the capital market." The new segment, which has been named New Energy, will be headed up by Jan Eyvin Wang, currently senior vice president for strategic investments.

HII

Wilkinson Named Ingalls President

Wilkinson Named Ingalls President

America's largest military shipbuilder Huntington Ingalls Industries named **Kari Wilkinson** to serve as executive vice president of HII and president of HII's Ingalls Shipbuilding division, effective April 1. She succeeds **Brian Cuccias**, who will retire.

Whitworth Joins Gulf Copper Board

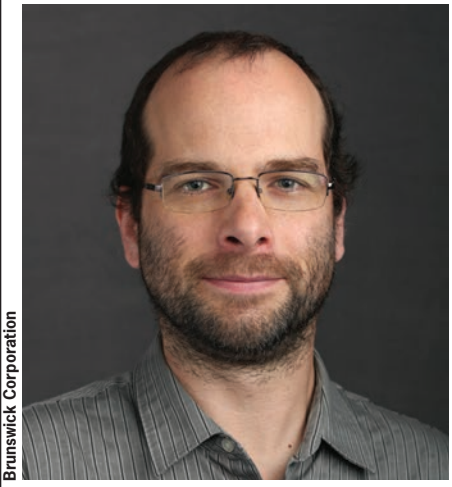
Gulf Copper and Manufacturing Corporation appointed **Jonathan Whitworth** as a member to its Board of Directors. Whitworth holds an MBA in Finance with a focus on Marine Business and currently serves as vice chairman of the TAMUG Board of Visitors.

Arbuckle Leads Brunswick Autonomy

Brunswick Corporation said **Jason Arbuckle** has been promoted to a newly formed role of Marine Autonomy Technology Lead. This new strategic position will enable the Enterprise to lead

Gulf Copper

Jonathan Whitworth.



Brunswick Corporation

Jason Arbuckle

FSG

Volker Hesse

the delivery of highly automated-to-autonomous solutions for the recreational marine industry.

Hesse Takes FSG Engineering Lead
Flensburger Schiffbau-Gesellschaft (FSG) has a new Head of Engineering as of March 1, 2021, when **Volker Hesse** takes over this core position. The mechanical engineer began his career around 20 years ago at Blohm & Voss shipyard in Hamburg.

Callan Marine Names Harner COO
Dredging contractor Callan Marine hired **Greg L. Harner** as its new chief operating officer.

New MD at Maersk Training UK
Maersk Training UK (MTUK) has appointed a new managing director as the company looks to expand its offering to the North Sea energy sector. **Leonardo Machado** joins MTUK having previously been managing director of the company's operations in Brazil for six years.

Sea Machines Hires David as CCO
Sea Machines Robotics, developer of autonomous command and control systems for commercial vessels, has hired Moran David as chief commercial officer (CCO).

Turrell Takes NTSB Safety Post
Longtime mariner and investigator **Morgan Turrell** was named director of the National Transportation Safety Board's (NTSB) Office of Marine Safety effective March 1.

Bouchard CEO Ordered to Step Down
A bankruptcy judge in Houston has ordered **Morton S. Bouchard, III**, fourth generation leader of family-owned Bouchard Transportation, to step down from his role as CEO.

Wille Named President of AAM
Bellingham, Wash. shipbuilder All American Marine (AAM) has promoted **Ron Wille** to the role of president.

Tidewater Promotes Rubio, Darling
Tidewater promoted two members of its executive team, **Sam Rubio** and **David Darling**, to the positions of chief financial officer and chief operating officer, respectively.

Fairbanks Morse Names Clark COO
Engines manufacturer Fairbanks Morse has named **Michael Clark** its new chief operating officer.

Crowley Promotes Warner to CFO
Crowley Maritime promoted senior executive **Dan Warner** to CFO.

All American Marine

Wille Named President of AAM


NTSB

Morgan Turrell


Callan

Callan Names Harner COO


Maersk Training UK

New MD at Maersk Training UK


Sea Machines

Moran David

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DNV Advises "Mind the (Safety) Gap"

A new approach to safety is necessary along maritime's rapid transition to a decarbonized, digitally smart future, says classification society DNV GL in a new white paper released this week, and as discussed on Maritime Reporter TV with **Knut Ørbeck-Nilssen**, *CEO of DNV - Maritime and* **Fenna van de Merwe**, *Principal Consultant at DNV, the report's author.*

By Greg Trauthwein

The white paper entitled "Closing the Safety Gap in an Era of Transformation", identifies a looming "safety gap" between shipping's existing approach to safety risks and its ambitions for greater digitalization and the adoption of alternative fuels. According to DNV, the new technologies and fuels required to meet the next decades' challenges are also creating a new risk landscape and demanding a new approach to safety.

While the safety message is clear, ship owners today are stretched thin by an industry transformation driven by decarbonization and digitalization, all the while maintaining an eye on safety.

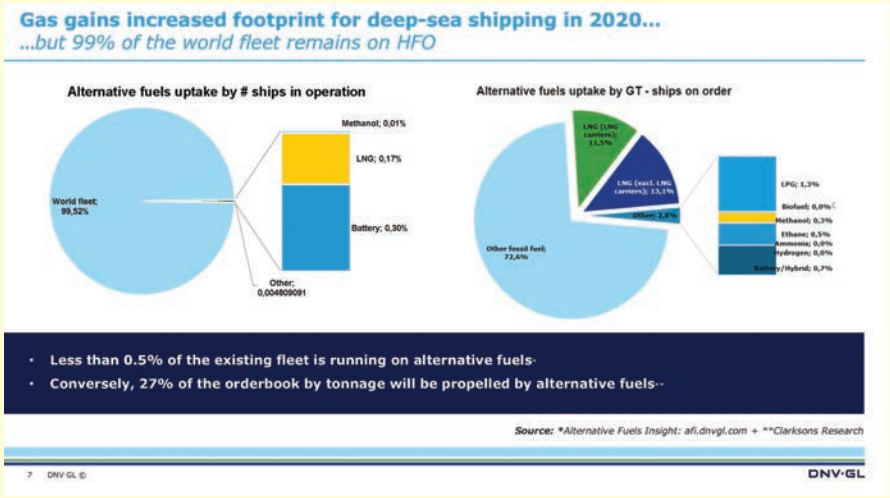
"The problem is that shipping is a fragmented industry, maybe one of the most fragmented transportation industries, and many ship owners have been through a period with really low returns, if any at all," said Ørbeck-Nilssen. While decarbonization technology and alternative fuels lead the headlines, the world fleet still runs, overwhelmingly, on heavy fuel oil (see chart). Significantly reducing emissions on existing ships is rather limited, and led mostly by slow-steaming. While slow steaming is effective at cutting emissions, if ships slow down too much there will be a breaking point and "at one point in time, it will make you unattractive as a vessel to be transporting goods," said Ørbeck-Nilssen. New construction offers greater latitude to incorporate energy saving, and today nearly 27% of the fleet on order features an alternative fuel choice.

"The challenge is building, keeping safety, keeping competence level with the seafarers, managing the digital transformation all at the same time," said Ørbeck-Nilssen. "That is why we put a lot of emphasis in this paper on collaboration. Nobody is interested in competing on safety; it has to be a collective (industry) effort to help all of these smaller ship owners."

While investing in safety is a cost, that cost during the design and engineering phase is miniscule compared to the cost of a major accident, said van de Merwe. "It shouldn't be an 'either or' discussion; it's not investing in digitalization and decarbonization and safety, but it's

Photos courtesy DNV

Fenna van de Merwe, Principal Consultant at DNV, left and Knut Ørbeck-Nilssen, CEO of DNV - Maritime



Knut Ørbeck-Nilssen, CEO of DNV - Maritime minces no words in calling the continued seafarer crisis and the inability to effectively change crews 'a disgrace.'

"The problem is, in many countries, the health department of the governments are setting the agenda, making the decisions, and internal bureaucracy inside of governments prevents a solution; I think that is where the problem lies. It must be the heads of state for those nations that have not yet signed up to take charge, show leadership, and assign seafarers as key workers."

investing in digitalization and safety by means of looking or incorporating the safety related risks, and whatever's necessary to tackle those safety related risks."

Breaking out of the Silos

The maritime industry historically has 'kept its cards close' in the name of competition, but van de Merwe contends that coming out of those silos, collaborating, has the power to elevate all. The trick, as always, is how to do it.

"(When we talk about) encouraging the industry to collaborate, I'm not saying give away your expertise," she said. "What I'm saying is use your expertise, stay true to it, and share what it is necessary to build a complete holistic risk picture. Don't work in silos, and draw conclusions just on that specific area that one might be working in, be it a piece of technology or a specific service, but stay true to that service and that expertise and use it in collaborative situations, like in joint industry projects where an overarching party," serves as a facilitator to ensure that all entities are communicating and working toward a common, collaborative goal.

The Green Shipping Program in Norway, a private public cooperation, is gaining a lot of international attention and participants, said Ørbeck-Nilssen, and he touts it as an example of how organizations from all ends of the market can come together to explore, trial and learn about new technologies and techniques – alternative fuels for example – for the benefit of the individual companies and the industry as a whole. "Recently it (the Green Shipping Program) launched a guidance on the use of ammonia as a fuel, and I think this is a perfect example. It doesn't make sense for a select few ship owners to try to use ammonia as fuel, and thereby have a competitive advantage, because it's all about infrastructure, availability, and price. Releasing this as a joint effort by the industry is sharing the information that is needed to manage using that type of fuel from a safety aspect (among a long list of other commercial considerations)."

MARITIME REPORTER TV **Watch the interview on MR TV: bit.ly/3w1MLTE**

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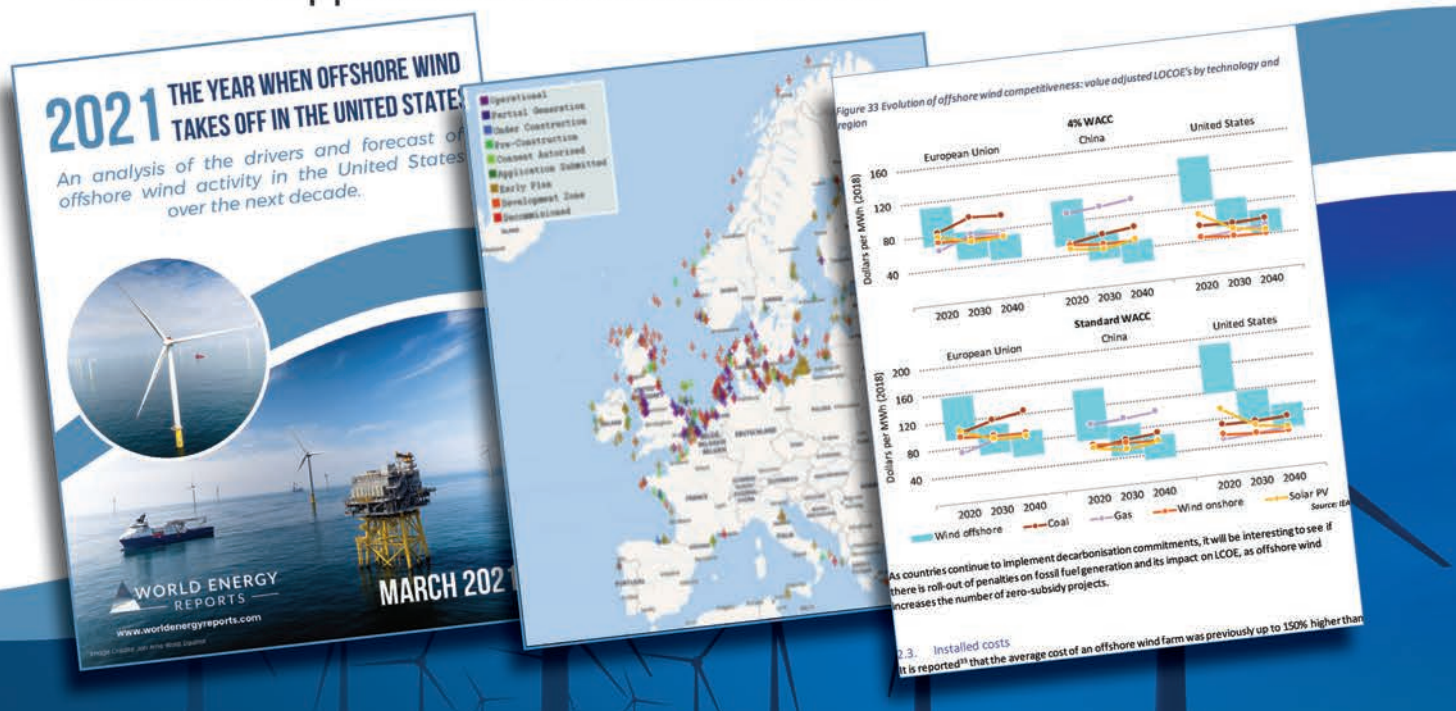

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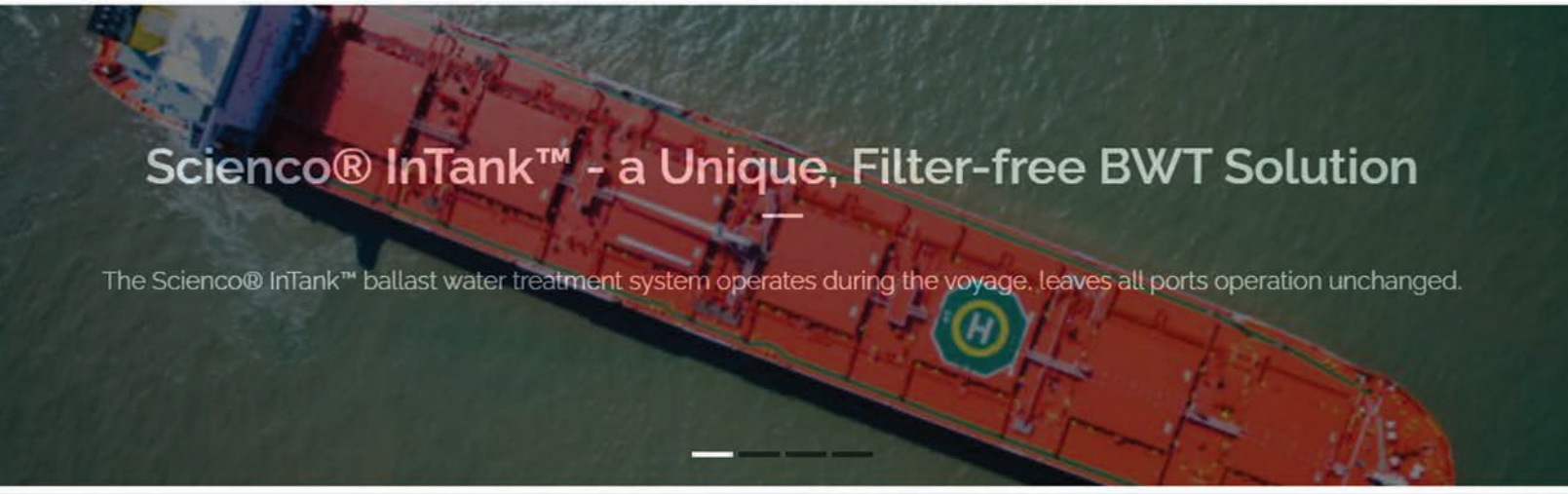

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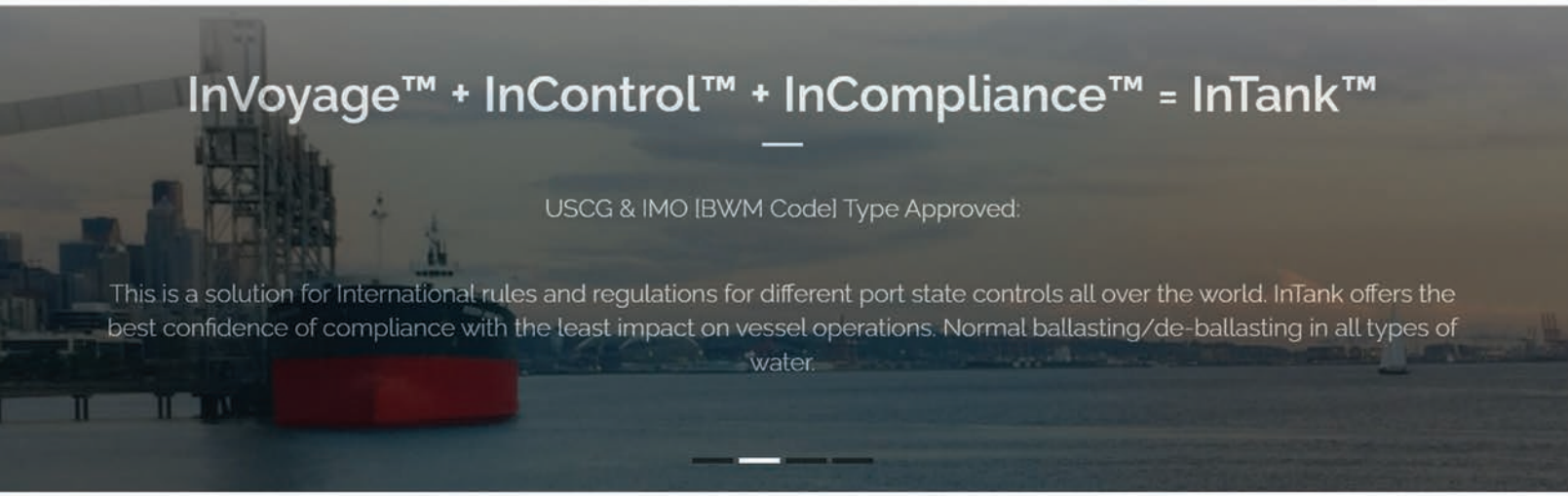

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