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By Eric Hawn

Seacat Weatherly is Seacat Services' new CTV, designed by Chartwell Marine for the U.K. offshore wind sector. A number of Chartwell 24 design vessels are currently on order at shipyards in the U.K. and U.S, including the Atlantic Endeavor being built at Blount Boats for Atlantic Wind Transfers.

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Haig-Brown



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Milito



van Hemmen

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EDITOR'S NOTE

The start of this year brought a healthy amount of optimism for offshore oil and gas as it began to look like the industry could finally shake that stubborn prolonged downturn that has been following it around for years.

Then the 2020 roller coaster ride began.

In March, a Russia-Saudi Arabia oil price war, together with the rise of COVID-19, sent oil prices tumbling and wreaked havoc on the industry and the global economy. By April, the spat and a significant demand reduction brought on by the coronavirus pandemic brought oil futures below zero. Traders were paying to offload contracts for oil they simply could not find room to store.

It's somewhat remarkable that today, after agreements on production cuts between Russia and Saudi Arabia, and modest demand and price stabilization as the world continues to grapple with the pandemic, that oil is in the \$40-45 range.

But there's no mistaking the damage that has been done, and it's expected the rebound for oilfield services providers will take several years at least. However, there are other opportunities out there. Many suppliers are looking to diversify and leverage some key oil and gas capabilities to replace major chunks of revenue by servicing the renewables markets.

Yes, oil and gas will continue to be a key piece of the global energy equation for many years to come. But renewables have been gaining ground and continue to gather momentum as time marches on. Even the oil majors are upping their involvement in renewables. In fact, this shift has been underway long before the recent oil price woes, and offshore wind investment in Europe is on pace to surpass offshore oil and gas in the near future.

Here in the U.S.—where marine and offshore oil and gas expertise is abundant—the rise of a new offshore wind industry presents an especially large opportunity for new and established players to gain business. And that's cause for optimism.

Eric Haun, Editor, haun@marinelink.com



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U.S. Offshore Wind Outlook

While the market potential for offshore wind energy is large and well-documented, the United States is still only an emerging player in this industry with no utility scale projects in operation to date. But the U.S. could quickly become a top-five offshore wind power nation within a short period of time, with estimated investment requirement of at least \$57 billion to install up to 30 gigawatts (GW) by 2030 along the Atlantic Coast, according to the American Wind Energy Association (AWEA).

To date, only Ørsted’s five-turbine 30 megawatt (MW) Block Island Wind Farm in Rhode Island state waters is operational and grid connected, and a small pilot project is currently under development in federal waters offshore Virginia. Three small demonstrators or prototypes have previously been tested and decommissioned.

But there’s plenty more on the way. In 2016, the U.S. Department of Energy (DOE)-funded National Renewable Energy Laboratory (NREL) produced a study of the U.S.’s 10,800 GW of net technical offshore wind energy potential, confirming the significant deeper water potential. As of June 2020, World Energy Reports (WER) has identified a project pipeline of over 33 GW

which extends beyond 2030 installation that requires at least \$63 billion of capital expenditure. The country is targeting 22GW of offshore wind by 2030 in line with issued federal leases.

There is high-quality wind resource relatively close to major demand centers. Of course, significant potential is found in the Atlantic along the East Coast, but other regions such as Pacific California and Hawaii, and even inland Lake Erie hold promise thanks to advancing floating turbines that unlock deeper waters for offshore wind projects.

There are two permit authorities for US offshore wind. At federal level, the Bureau of Offshore Energy Management (BOEM), which sits within the Department of the Interior (DOI), is responsible for developing offshore resources in federal waters (3-200nm) of the Outer Continental Shelf (OCS) and hosts lease auctions. For projects less than nautical miles offshore and in inland lakes (such as Lake Erie) the permitting process is under control of each state, and the DOE is the lead federal agency.

At state level, there are range of targets and support policies (see chart below).

State	Target set	Target
New York	2019	<ul style="list-style-type: none"> • 9GW installed by 2035 • 1-2.5MW to be tendered 2H 2020
New Jersey	2018	<ul style="list-style-type: none"> • 3.5GW by 2030 • 1,200MW to be tendered 2H 2020
Massachusetts	2016	<ul style="list-style-type: none"> • 3.2GW installed by 2035 • 800MW to be tendered 2H 2021 (3rd Round)
Connecticut	2019	<ul style="list-style-type: none"> • 2GW installed by 2030 • 800MW to be tendered 2H 2021 (4th Round)
Virginia	2018	<ul style="list-style-type: none"> • 2GW installed by 2030
Maryland	2019	<ul style="list-style-type: none"> • 1.2GW installed by 2025 • 400MW to be tendered 1H 2020 (2nd Round) • 400MW to be tendered 1H 2021 (3rd Round)
Rhode Island	2019	<ul style="list-style-type: none"> • 1GW by 2025

Federal tax credits currently provide incentives for project development in the form of two options, the Production Tax Credit (PTC) or the Investment Tax Credit (ITC). The PTC, currently \$0.009-0.023/kilowatt hour (KWh) depending on the year of construction and is being phased out and falls to 0% for projects starting after January 1, 2021 (although developers are lobbying for extensions of the full PTC). The ITC is currently 12-18% depending on the year of construction.

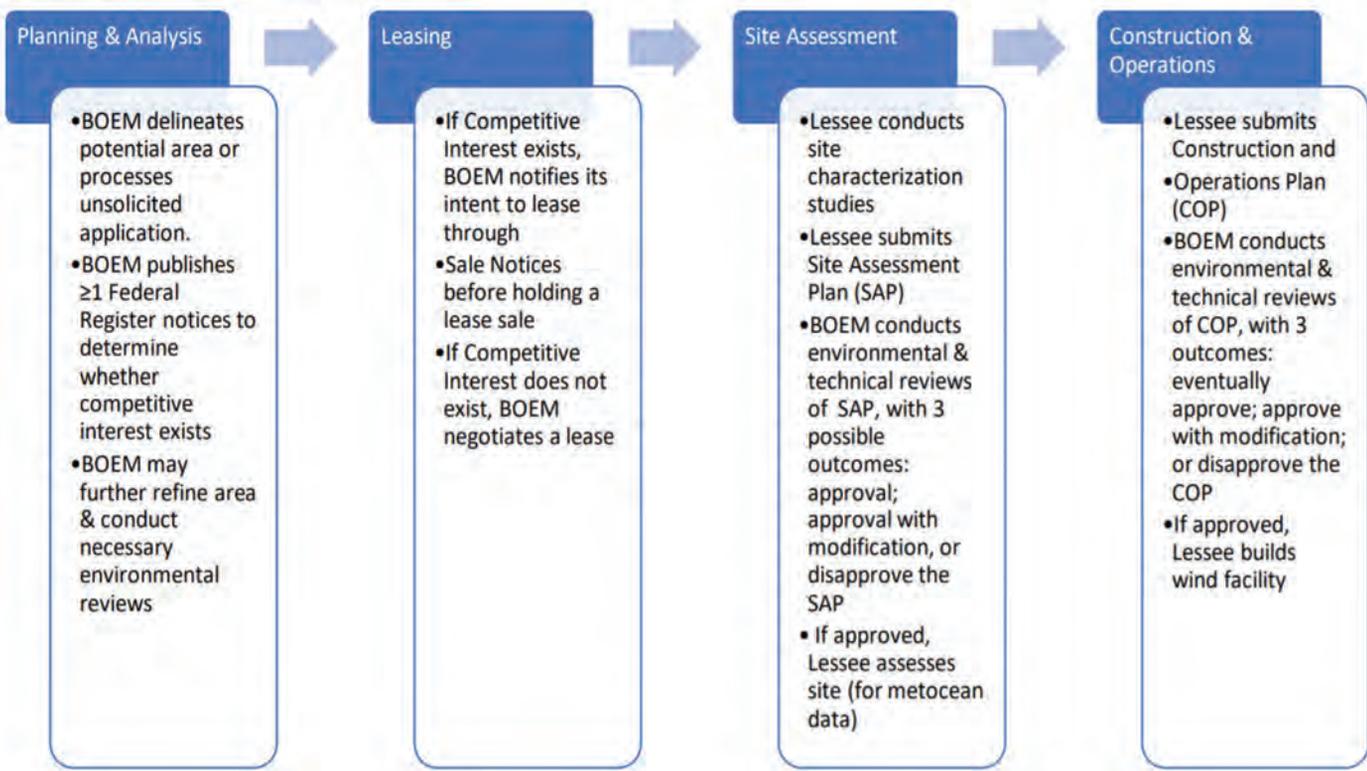
State level offshore renewable energy credits (OREC) that enable non-recourse financing of offshore wind projects are where a state body buys quantities of electricity from the developer at a set price and on-sells to the utilities. In Maryland, Ørsted's 120 MW Skipjack will sell 455,482 OREC's and Toto Holdings 248 MW MarWind 913,945 OREC's at an above market levelized price of \$131.94/megawatt hour (MWh) for 20 years. In New York, it is the New York State Energy Research and Development Authority (NYSERDA) that is buying OREC's from Ørsted's 816 MW Empire Wind.

By the end of 2019, BOEM had awarded 15 leases (and plans further auctions for New York, Hawaii, and California) in accordance with the four stages of BOEM's wind authorization process (see graphic below).

The first project to successfully navigate the BOEM process is the first stage 12 MW Coastal Virginia Offshore Wind (CVOW) pilot by Dominion (with Ørsted as OWF EPC), the first phase of a three-phase up to 3.2 GW development by Dominion Energy. The two turbines, monopiles and transition pieces of the demonstrator left Europe for U.S. waters in April 2020 and construction commenced on arrival 27 miles off the coast of Virginia Beach, Va., wrapping up in July. Dominion has kicked off ocean surveys to map the seabed for with a view to start building out 2.6 GW of CVOW from 2024 (for which Ørsted has exclusive partnership development rights).

The pipeline of projects that have BOEM awarded leases (and are going through the steps identified below), or prototypes and demonstrators amounts to approximately 22 GW over 32 projects.

BOEM wind authorization process





All photos: Robert Allan Ltd.

Mike Fitzpatrick

President and CEO,
Robert Allan, Ltd.

Robert Allan Ltd. is a consulting naval architectural firm, established in Vancouver, Canada in 1930. Mike Fitzpatrick has been a driving force in the company's growth since joining the firm in 2003. As a key member of the initial employee ownership group, he was named president and CEO in 2015, responsible for corporate direction, business development, management of senior project managers, and project priorities, schedules and profitability. Fitzpatrick is a 1995 graduate of the University of New South Wales in Australia, with a Bach-

elor of Engineering in naval architecture. Prior to joining RAL, he worked as a naval architect at InCat Designs in Sydney Australia.

As tug designs continue to evolve, what are some of the key ways that Robert Allan Ltd. is helping to make these vessels safer, greener and more cost efficient?

Robert Allan Ltd. has made a considerable investment in the development of some very sophisticated design tools – in particular computational fluid dynamics (CFD) and finite element analysis (FEA). CFD allows us to accurately predict the characteristics of a vessel in ways that are not possible with conventional empirical methods. CFD also help us design hull shapes that are more efficient and therefore have better fuel economy. FEA allows us to calculate



“The RAstar 3800-DF delivered to the Port of Ningbo in China is probably the most representative of our status as one of the leading innovators in the tug design world. That the tug was built in China for a Chinese operator is a testament to the value that we provide our clients.”

– Mike Fitzpatrick

the stress in high load areas, making them stronger without excess weight. We also work closely equipment manufacturers to integrate the latest in new technologies into our designs, enabling customers to be assured that their vessels are utilizing the latest in technologies and fully meet all their expected performance requirements.

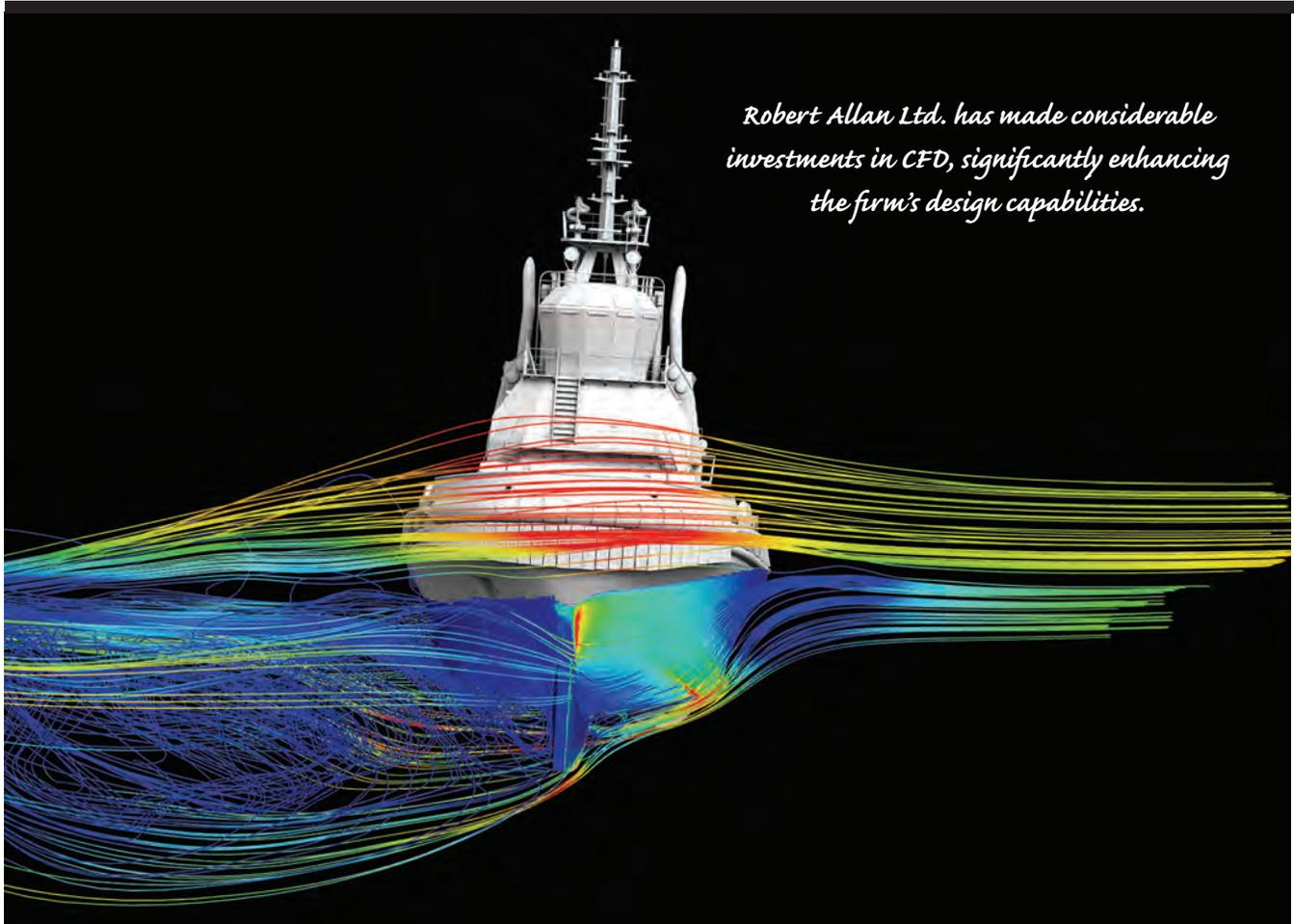
How do you see the future for remotely operated, automated and autonomous workboats? Please describe Robert Allan Ltd.’s efforts and goals on this front.

We expect to see interest in remotely operated workboats increase for hazardous applications like firefighting and for tug applications that involve higher levels of risk to crews today. This includes bow tug operations with ships moving at speeds over 5 knots, and tanker hold-back operations

which can be very demanding on crews in uncomfortable sea conditions for hours on end. With more specialist vendors of control and communication systems for work boats having entered the market over the last few years, there are more options than there once was for our clients who may have their own supplier preferences or working relationships for these crucial systems. As naval architects, we can focus on system integration and designing the best possible physical workboat platform, taking full advantage of the space that becomes available from not having crew on board. We are taking the opportunity rethink arrangements for equipment and propulsion to improve performance and reduce size. We believe that the best way to capitalize on the potential advantages of remote operation is to tailor a workboat design as closely as possible to suit the client’s mission and business goals. In other words, the design should be mission-driven, not generic. This is second nature for us since we have a history of customizing our workboat designs to suit our clients, so we are simply carrying this approach forward with our uncrewed designs, but can now do so to an even greater extent.

Robert Allan Ltd. has been involved in several LNG and hybrid tug and towboat projects globally. From your perspective, why has the uptake of these technologies been slower in North America compared to other regions? Do you see a shift happening in North America?

It’s worth making the distinction between LNG tugs and hybrid tugs in answering this question because the drivers are slightly different. When it comes to LNG as



Robert Allan Ltd. has made considerable investments in CFD, significantly enhancing the firm's design capabilities.

fuel, Europe and Norway took an early lead because of the NOx tax imposed in 2008 and initiatives like the Norwegian NOx Fund to support low NOx solutions like LNG as fuel. This was not the case in the U.S. at the time. Although LNG was attractive as a lower cost fuel than diesel, with tugs the business case for choosing LNG was not always clear due to high capital cost premium for LNG systems unless the annual fuel consumption was exceptionally high. The relatively large space required to accommodate cryogenic storage tanks can also work against LNG where a highly compact tug is called for. While the uptake of LNG in North America has been slower than other regions, the adoption of LNG as fuel on workboats has also been slower than expected globally. There are probably two main reasons. A few years ago, LNG was one of the few options to meet the stringent IMO Tier III NOx emissions limits in Emission Control Areas (ECAs), however engine manufacturers now offer SCR-based solutions for conventional diesel engine that can work out to be more economical and space efficient. The lower price of oil has also reduced the economic case for turning to LNG solely as a means to reduce cost. That said, LNG remains at-

tractive as a relatively inexpensive, clean-burning fuel and we expect to continue designing LNG tugs, especially for ports and terminals where LNG is readily available.

When it comes to hybrid powering systems on tugs and workboats, the capital cost premium is also such that the business case tends to depend on incentives like those behind the first North American hybrid tug, the Robert Allan Ltd.-designed Carolyn Dorothy in 2009, where funding from government and port sources was available to reduce fuel consumption and emissions. Today, in a more general sense, we expect to see hybrid tugs playing a role wherever a high value is placed on reducing environmental footprint in a local context. One recent example is the Swedish Port of Luleå for whom we designed the new 36-meter icebreaking Vilja tug. Of course, environmental footprint may also take into account underwater radiated noise (URN) and its effects on marine life. Hybrids with batteries allow quiet running on batteries alone, at least for some period of time during operations in environmentally sensitive areas. We are already working on low carbon designs of battery electric tugs and pilot boats for operations where shore charging from renewables is possible. It is difficult to predict the number

of hybrid tugs for the North American market, or any other market for the time being, since the demand is not driven by economics alone, but by the value placed on reducing environmental footprint by a given operator, port or government and the incentives or regulations that prevail locally.

What is your top goal as president and CEO, and what is being done to help achieve it?

My primary goal as president and CEO of Robert Allan Ltd. is to preside over our 100th anniversary party in 2030. Not as president anymore because I will certainly have handed over the reins to the next generation by then if I have done my job properly. The 10 shareholder employees that bought the company from [chairman Robert G. “Rob” Allan] in 2008 consider ourselves to be the fourth generation in the Robert Allan Ltd. storyline even if we don’t share the same bloodlines as Rob, his father and grandfather. We have hopefully put the company on a path to maintain independent internal ownership for several more generations to come. A fifth generation of employee ownership is now already well established at Robert Allan Ltd., and I am highly confident that they will take the company onwards and upwards long after I have stepped aside.

What do you count as your top challenge, and what is being done to address it?

The top challenge I face really depends on which day of the week it is because it is an ever-changing landscape. Keeping our employees engaged and rewarded in a competitive international business environment is near the top of my list most days, but so is strategic planning to maintain our position as the leading international designer of small commercial workboats. Solving the latter of these challenges generally also takes care of the former. Staying at the forefront of our market segment requires continuous improvement so we invest heavily in our internal processes, R&D and the tools needed to support this improvement. There aren’t many naval architecture firms specializing in relatively small workboats that can afford to invest in valuable infrastructure like a million-dollar CFD like we have done, so we leverage this advanced analytical capability to maintain our current strong position.

How has the coronavirus pandemic materially impacted your business to date?

The coronavirus pandemic has surprisingly not had a significant material impact on our business so far. We had a couple of projects canceled in the initial few weeks when

the uncertainty levels were high but have since settled into a nearly normal workload. We consider ourselves to be very lucky that our profession lends itself well to a remote working environment. Even before the current crisis, we already had a number of employees scattered about the globe working remotely, so we already had the computer infrastructure in place to allow all of our employees to work efficiently in a remote environment. Incredibly, all of our good shipyard clients around the world have found ways to continue production safely and efficiently in the midst of this pandemic.

Please describe how you came to a career in the maritime industry. When did you first know you wanted to become a naval architect?

I studied aeronautical engineering in Canada when I finished high school in the early ’80s but a passion for sailing and travelling got in the way of my studies after the first year and led me astray for most of a decade. I went back to university to study naval architecture in Australia in my late 20s. That first engineering calculus course after 10 years out of school almost ended my academic comeback but I managed to struggle through somehow. Life is (hopefully) full of impactful moments where you can choose one path versus another, and so I am grateful that my younger self managed to stick it out as a mature student.

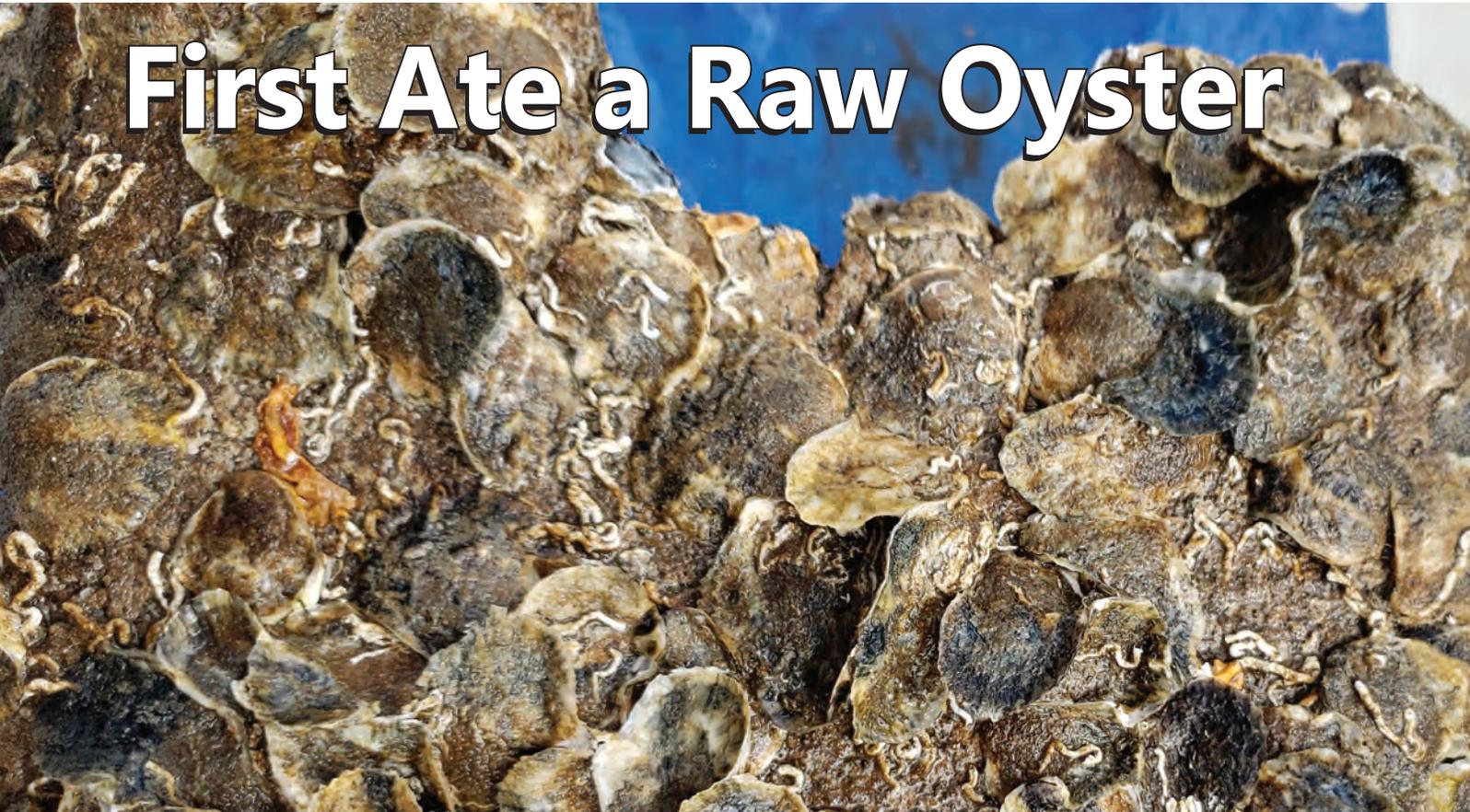
What advice would you give a young naval architect just entering the industry?

I think working in a design office is an excellent professional environment but it is good to get some shipyard experience first if you can. It’s hard to grasp the implications of a poor structural detail you’ve drawn up on a computer if you don’t have a production team next door threatening to make you weld it up yourself. Rule number one for a professional engineer is to never pretend to know more than you actually do.

Hybrid tug Carolyn Dorothy



To the Bold Man Who First Ate a Raw Oyster



This is a technical article related to risk assessment, which is incredibly central to maritime endeavors. We operate in an environment with many unknowns and high unpredictability, and anything we do requires a risk assessment. In fact, naval architects, marine engineers, ship's engineers and, most of all, ship masters do nothing but cast whatever they do in terms of risk.

Risk assessment can be mathematically evaluated, but most of us analyze risk based on experience. Let's face it, a first boat trip for a 16-year-old is simply a fun ride, but once they have experienced a few bad trips and trip ups, a boat trip becomes an entirely different animal.

In maritime, and also daily life, risk too often is perception, but our perceptions are often wrong. Maybe someday I will write about the Inspection Paradox and why it can be true when an airline says that only a small percentage of their flights are full, and why most frequent flyers can truthfully indicate that most of their flights are full.

But here I will talk about perceptions and oysters. Jona-

than Swift is credited with saying, "It was a bold man who first ate a raw oyster." I was not first, and, by having others eat them first, I learned to like eating raw oysters, even though raw oyster consumption, like beef tartare, and even raw salad consumption, is not completely without risk (I tell my wife I manage that risk by cutting down on salads).

Besides being tasty, oysters are also an extremely important component of our littoral ecosystems. Without oysters, complete littoral ecosystem restoration is not achievable. This is why there are so many places where people try to restore oyster populations and especially oyster reefs.

And this occurred in the Navesink River in New Jersey in the first few years of this century. But then in 2008, just when the oysters started to settle in, the state came in and told the local baykeeper to dig them up and destroy them because they were being grown in waters that were not approved for oyster cultivation. The water was safe for swimming and even for clamming (but requiring post catch purification), but did not meet raw oyster consumption

Risk Assessment

By Rik van Hemmen

standards. However, the last thing that anybody wanted to do was eat these oysters. These oysters were supposed to stay in place and thrive and clean up the water. Regardless, the state quoted oyster consumption regulations and argued that somebody could sneak in, dig up the oysters, sell the oysters and somebody could get sick. The oyster bed was removed.

But let's get back to risk assessment, is there an elevated risk from this effort? Various things need to happen to get someone sick from one of these stolen oysters.

1. Somebody needs to want to steal the oysters
2. The thief does not get caught
3. The thief needs to sell the oysters and lie about their origin
4. The oysters need to carry disease
5. A person needs to get sick

It could happen, but is there an elevated risk? The elevated risk is actually very slim. The chance of oyster contamination from a certified oyster bed is not zero. It is a real risk that has been driven down to an acceptable level (let's call the risk .01%). A certified bed will inevitably have its oysters removed for consumption, while the oysters in the Navesink are intended not to be removed for consumption. It is reasonable to assume that the risk of contamination of a Navesink oyster is higher, but how much higher? Let's assume the odds of a Navesink oyster carrying a disease that will make someone sick is 10 times higher (.1%). That oyster still needs to make into the human food chain and that would mean that a thief can steal the oysters at will, not get caught, and sell the oysters. Let's assume an effort at theft happens at a rate of 50% of the normal certified bed harvesting rate (high), and that the thieves get caught only 50% of the time (probably low in our case), and manage to confuse seafood wholesalers 50% of the time (probably high). In that case the odds of these contaminated oysters ending up on your plate are only marginally higher than the odds of getting sick from a certified oyster. ($.1\% \times .5 \times .5 \times .5 = .0125\%$, barely more than .01%) In other words there is no elevated risk at all of getting one of those oysters on your plate, it just appears that way at first glance.

This is a mathematical approach to risk, there are many other arguments that show that the removal of the reef made no sense. There are many places where there are oysters in uncertified waters. So why is there no nefarious har-

vesting of those oysters? And why don't we have any people getting sick from those oysters? (Note the similarity to the vote by mail debate arguments.)

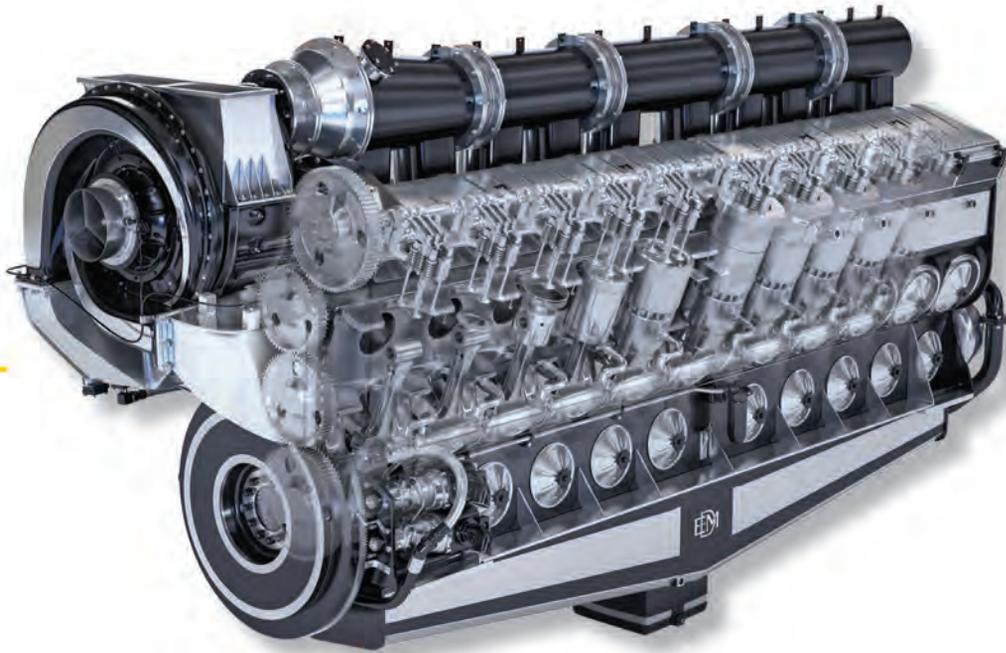
The problem is that a lot of policy gets made at first glance, rather than after deeper examination, and often policy sweeps with a wide broom rather than with a surgical brush. What actually occurred is that a valid regulation for human oyster consumption is now being applied to oyster reef restoration, and one simply is not the same as the other. This occurs more often than we tend to realize; regulations that make sense in one context are applied in another context without a further evaluation of the associated risks and benefits.

The Baykeeper has been pressing the state for a resolution on this issue since 2008, but no headway has been made. The oyster consumption regulation needs to be decoupled from oyster reef restoration, but even if it cannot be resolved at a regulatory level, the state could simply accept a risk reduction approach. In this case that is quite easy, since mounting IR cameras to monitor the reef is cheap and easy to do. This would very strongly reduce the odds of theft and its associated risk, and is a simple rational solution. However, it runs into an issue that Jonathan Swift is also quoted on: "You cannot reason someone out of something they were not first reasoned into."

Meanwhile, the river is not getting any clearer. Regulations are important to maintain societal equity, but when a regulation prevents a rational problem solution, we move into the world of Gulliver's Travels; maybe amusing to read about, but not a good place to live.

For each column I write, MN has agreed to make a small donation to an organization of my choice. For this column I nominate the NY/NJ Baykeeper, <https://www.nynjbaykeeper.org/> to support their oyster restoration efforts.





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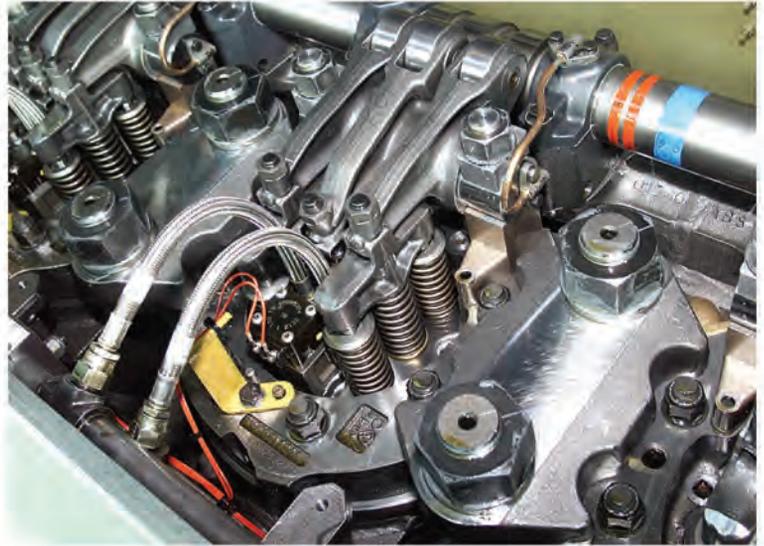


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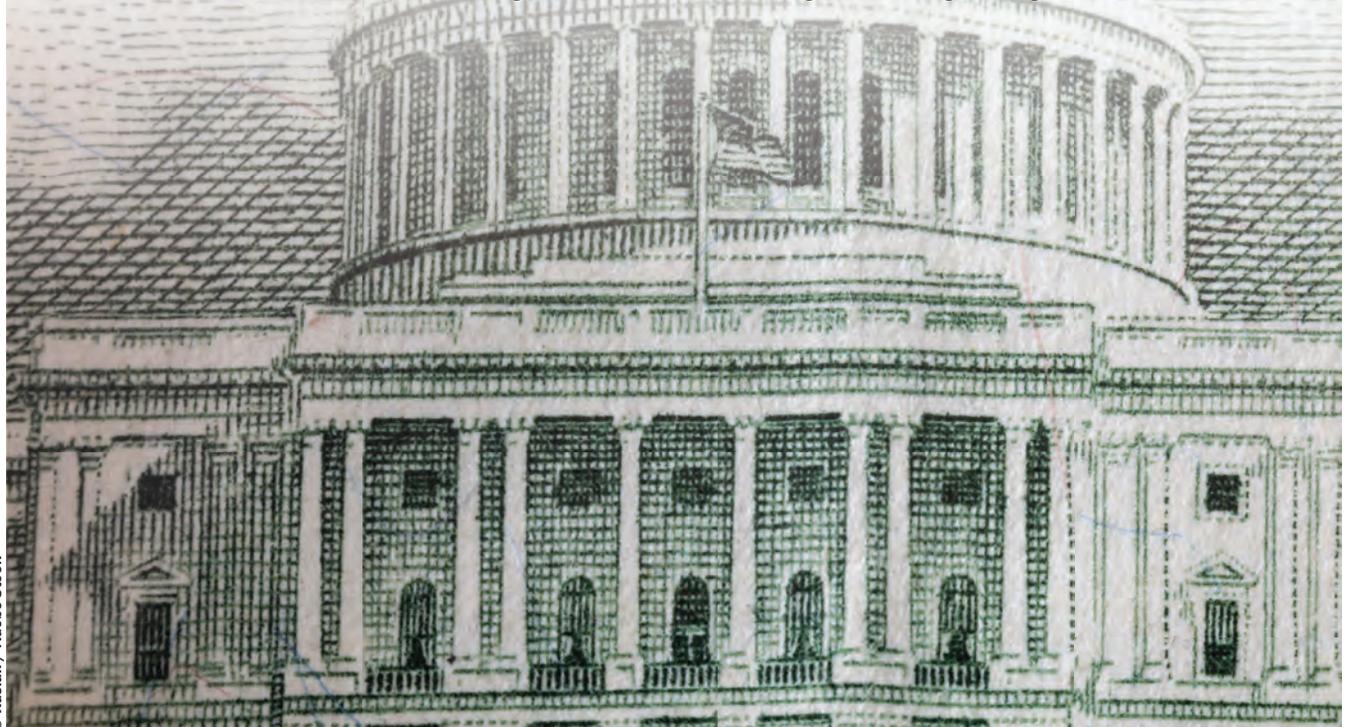


Washington Watch: Congress Eyes Maritime Economic Relief

The Coronavirus Aid, Relief and Economic Security (CARES) Act enacted in March 2020, provided relief to numerous industries impacted by the COVID-19 pandemic. Air carriers, for example, benefitted from the creation of a \$25 billion Treasury direct loan program, in addition to a \$25 billion worker support program that provides a mix of grants and loans to cover employee wages, salaries and benefits. In addition, Congress waived the small business affiliation rules for businesses in the accommodation and food service industries to increase the availability of Paycheck Protection Program loans to such businesses. The CARES Act also provided supplemental appropriations to support other existing programs, including \$9.5 billion to assist agricultural producers, \$300 million to support fishermen, and \$150 million to support arts organizations, museums and libraries. However, the maritime industry – including the offshore

sector – was noticeably absent from the free flow of federal funding in the CARES Act or the subsequent Paycheck Protection Program and Health Care Enhancement Act.

On July 9, 2020, Chairman of the House Committee on Transportation and Infrastructure Peter DeFazio (D-Ore.) and Chairman of the House Subcommittee on Coast Guard and Maritime Transportation Sean Patrick Maloney (D-N.Y.) sought to correct Congress' error through the introduction of the Maritime Transportation System Emergency Relief Act (MTSERA). In introducing the legislation, Chairman DeFazio properly noted, “The men and women who work within the Maritime Transportation System are part of our Nation’s essential workforce that has been key to keeping critical goods moving during the global pandemic, and for that, we owe them a debt of gratitude.” He added that the legislation sought to “give the maritime sector the



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Washington Watch

By Jeff Vogel

same protections and relief given to other industries during COVID-19, and will close a huge gap in current federal emergency assistance that has left links in the maritime supply chain isolated and unable to access other assistance programs available to other industries.”

MTSERA, if enacted, would create a new program by which the Maritime Administration (MARAD) could issue grants to State entities or U.S. companies engaged in “vessel construction, transportation by water, or support activities for transportation by water.” The grant funding could be used for the costs of capital projects to protect, repair, reconstruct, or replace equipment and facilities of the U.S. maritime transportation system that MARAD determines is in danger of suffering serious damage, or has suffered serious damage, as a result of an emergency. In addition, the funding could be used to cover one year (with the opportunity for an additional year) of operating costs of U.S. maritime companies affected by an emergency, including costs related to emergency response, cleaning, sanitization, janitorial services, staffing, workforce retention, paid leave, protective health equipment and debt service payments.

Immediately following its introduction, MTSERA was added to the House version of the National Defense Authorization Act for Fiscal Year 2021 (NDAA), which was passed by the House on July 21, 2020. The Senate version of the NDAA, passed by the Senate on July 23, 2020, did not contain a similar provision. The House and the Senate will conference later this year to resolve differences between the two versions of the NDAA, and maritime stakeholders will need to keep a close eye as to whether MTSERA survives the conference and ultimately ends up on the President’s desk as part of the NDAA.

Relatedly, the House and Senate Appropriations Committees have begun discussions regarding a potential Continuing Resolution to temporarily fund the federal government at the beginning of FY 2021 in October. MTSERA, even if ultimately passed as part of the NDAA, is merely an authorization that will require Congress to provide separate funding. It will be interesting to see whether funding for MTSERA – or a similar COVID-19 maritime relief program – enters into the Continuing Resolution discussion. Notably, the six-bill appropriations “minibus” passed by the House on July 31, 2020, contained significant maritime support program funding, including \$314 million for the Maritime Security Program, \$10 million for the Cable Security Fleet (created under last year’s NDAA), \$389 million

for the National Security Multi-Mission Vessel Program, and \$300 million for Port Infrastructure Development grants. Congress is clearly willing to fund maritime support programs, it is simply a matter of whether they are willing to extend that funding to all parts of the industry impacted by the COVID-19 pandemic, including the offshore sector.

The state of offshore lifting operations

In addition to MTSERA, the House-passed NDAA included the Elijah E. Cummings Coast Guard Authorization Act of 2020, which would reauthorize the U.S. Coast Guard and Federal Maritime Commission. According to Chairman DeFazio, the bill would “strengthen the Coast Guard by enhancing navigation and maritime safety, increasing funding to address a \$1.8 billion backlog in shore infrastructure and deferred maintenance, authorizing new family leave and child care policies and increasing gender and racial diversity in the Coast Guard Academy and within the ranks.”

Noticeably absent from the bill, however, was a provision regarding offshore “installation vessels” that was included in last year’s Coast Guard Authorization Act, which was passed by the House but was never acted upon by the Senate. In essence, the provision would have permitted the use of foreign heavy lift vessels for the installation of platform jackets only if the Secretary of Transportation determined that there were no qualified U.S.-flag vessels available. The provision was supported by the Offshore Marine Service Association but was strongly opposed by certain offshore oil, gas and wind stakeholders.

The absence of the installation vessel provision potentially clears the path for increased foreign heavy lift operations in the U.S. offshore market. This sentiment is further reinforced by U.S. Customs and Border Protection’s (CBP) November 2019 (effective February 2020) decision to revoke long-standing interpretative rulings that prohibited any movement of a foreign vessel with merchandise aboard during lifting operations in U.S. waters. Under the revised interpretation, CBP permits foreign heavy lift vessels to engage in lifting operations that include certain lateral movements when the movement is necessary for the safety of surface and subsea infrastructure or the vessels and mariners involved. Undoubtedly the political and legal fight over offshore installation vessels will continue and it will be important for U.S. offshore operators to monitor which way the Congressional winds blow.

The Gulf of Mexico: An Energy Platform for America

Even as business, schools and scenes from everyday life seem frozen as society adjusts to the coronavirus, the U.S. marches closer toward the November presidential election. In early August, Vice President Joe Biden announced Senator Kamala Harris as his running mate. As the Biden-Harris ticket works out their policy platforms, they should move beyond past comments attacking American offshore oil and gas production. In fact, a strong American offshore oil and gas industry is a platform every candidate should stand behind.

Between New Orleans and Houston, Interstate 10 winds through bayous, rivers, woodlands and plains. Thousands of companies and hundreds of thousands of people that call this area home are linked by a mutual mission: safely producing American offshore energy.

In 2019, the U.S. Gulf of Mexico produced an average 2.3 million barrels oil equivalent per day. More than 345,000 men and women employed by dozens of operators and producers and thousands of suppliers, service companies, specialists and other expert businesses worked in concert safely producing homegrown American energy.

The economic impact of Gulf of Mexico oil and gas production stretches beyond the Gulf Coast, too. From buoy specialists in Maine to personal protective equipment manufacturers in Minnesota to software companies in Florida to automation experts in Connecticut, every state has jobs and economic investments dependent on Gulf Coast energy production. The U.S. offshore industry had a more than \$28.6 billion impact on U.S. GDP last year.

Gulf of Mexico oil and gas production not only drives



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Offshore NOIA

By Erik Milito

economic growth, it supports the environment and strengthens our national security. Every barrel produced in the U.S. Gulf of Mexico, is a barrel that American consumers – and our allies – do not have to import from countries such as Russia and Venezuela.

Government revenues from our offshore oil production can be used to fund vital programs, including programs furthering environmental stewardship. In fact, virtually every single dollar of the \$1 billion of funding for the Land & Water Conversation Fund last year came from offshore oil and gas revenues. President Trump recently signed into law the Great American Outdoors Act, which allocates funding from offshore oil and gas to much-needed maintenance of our nation's treasured national parks.

But this wellspring of energy, economic and national security is threatened through restrictive Federal policies.

During his debate with Senator Bernie Sanders, Vice President Biden said, "no offshore drilling." Previously, Senator Harris tweeted that "offshore drilling threatens the health and well-being of the American people." Vice President Biden and Senator Harris should resist the call from some more progressive circles to permanently halt Gulf of Mexico oil and gas exploration and production.

The Biden-Harris ticket places a great emphasis on environmental justice and growing attention will be placed on this important issue. Offshore energy development occurs far and away from population centers and eliminates the "not-my-back-yard" complaints, thereby also eliminating issues associated with environmental jus-

tice. Furthermore, the offshore oil and gas industry is an established part of the fabric of the Gulf Coast, providing employment and economic support for coastal and local communities through the region. Our companies and their employees are proud neighbors and greatly contribute to the support of the local education, healthcare and social needs of the local communities.

The benefits of continued production in the Gulf should be embraced. By 2040, the Gulf of Mexico energy industry could support 367,000 jobs, create \$31.1 billion in annual gross domestic contributions, provide \$30 billion in annual industry spending and generate \$6.7 billion in annual government revenue. Conversely, an offshore leasing ban would reduce the economic and employment outlook by 50% to 60%, while a drilling ban

would cut them by 75% to 85%.

Development of the Gulf of Mexico has led to the creation of world-class infrastructure and some of the most robust environmental and safety regulations and standards in the world. Companies want to keep working in the Gulf of Mexico. Since 2014, the region has trailed only Guyana as being the most productive prospective offshore region.

Continued investment translates to continued American energy, continued high-paying jobs, and continued national security. The Gulf of Mexico can remain a prolific basin for decades to come and continue to be an energy and economic driver. America's future can remain bright due to the ingenuity and dedication to safety of the men and women of the offshore energy industry. Success for the Gulf means success for America.

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Reaping the Rewards of Hybrid Solutions

Gunder Tande Sandersen

Norwegian offshore support vessel owner Island Offshore has awarded a contract to Kongsberg Maritime to supply turnkey hybrid battery solutions for three platform supply vessels (PSV).

Two of the vessels, the 96-meter Island Crusader and Island Contender (delivered in 2012), previously operated with a combination of Bergen liquefied natural gas (LNG) engines and Bergen diesel engines, while the 93-meter Island Commander (delivered in 2009) deploys four diesel engines. Now they will be equipped with battery packs and shore connections.

"The conversion of all three into hybrid craft not only represents a firm commitment on the part of Island Offshore to the principles of environmental responsibility but also unlocks a wealth of potential for increased operational efficiency and a marked reduction in maintenance requirements. This in turn translates to significant cost savings for the company," Kongsberg Maritime says.

Instant benefits

In the past, PSVs have typically run multiple engines to achieve redundancy, with consequent impacts on fuel performance, equipment health and emissions, Kongsberg says.

However, the Norwegian marine technology company says, combining conventional LNG or diesel engines with Kongsberg's SAve Energy battery system produces instant benefits.

"The batteries allow for fewer engines to be running, thus improving efficiency by increasing the load on the remaining engines while also instantly delivering power on

demand: ideal in the context of low-load operations such as dynamic positioning. Fuel consumption and running costs will also be reduced through conversion of the vessels to closed bus-tie operation," Kongsberg Maritime says.

The solution opted for by Island Offshore will operate via a single feed from the energy storage system (ESS) to the main switchboard – with manual changeover that will enable the operators to balance out running hours on generators – and a 600kW dual shore connection.

Kongsberg Maritime's 8-meter ESS 896 kWh deckhouse will encompass a standard, type-approved, liquid-cooled container solution with air-cooled SAve Energy batteries. The extensive scope of supply will also involve modifications to each vessel's main switchboard and K-Power EMS energy management system, as well as an upgrade of the Acon automation and alarm system.

Deck space unaffected

In a mid-August statement, Island Offshore revealed that the Island Crusader has already been sailing on battery since early summer.

"Ordering energy-saving and eco-friendly systems for all three vessels is very pleasing. Two of the vessels are already running on LNG or optionally marine gasoil (MGO), and will now additionally have batteries and shore connection installed. This will contribute significantly to reducing emissions," says Island Offshore's Managing Director, Tommy Walaunet.

A battery pack can be used as the spare capacity and ex-

tra safety when the vessel is alongside a rig, thus saving both fuel and generator running hours, Island said. In addition, the battery will contribute with quick and effective power during transit, reducing the need to start up an extra generator for peak loads.

"As the gas engines perform best when running on constant load, the combination with batteries is ideal," Island Offshore says.

"The generator does most of the work while the battery absorbs the variations up and down, resulting in smooth sailing without the great need of extra engine power to handle head sea," Walaunet explains.

Kongsberg Maritime will deliver batteries and ESS for the PSV trio. Kongsberg is familiar with the vessels, as the company also delivered design, propulsion, engines and other main equipment when the vessels were built at the Vard Brevik shipyard in Norway.

All three vessels are chartered by Lundin Energy Norway on long-term contracts.

Island Offshore assures that the batteries will not affect the deck capacity of the vessels.

"The vessels will be equipped with battery containers placed on a mezzanine deck aft of the wheel house, to avoid the vessels losing valuable deck space when working as supply vessels," the Norwegian vessel owner adds.

In addition, shore power connections will be installed enabling the vessels to lay alongside quays without using engine power where shore-side electrical power is supplied. In ports without shore power vessels can activate harbor mode, using battery power only.

"This reduces engine-running hours significantly and is a considerable contribution to reduce the local environmental impact, as well as fuel costs. The generator will only startup when

the batteries are discharged, in order to recharge them," Island Offshore says.

Supporting Lundin's offshore ops

"All three vessels have been chartered on long term contracts by Lundin previously, thus Lundin knows our vessels well. By further developing these vessels together with us, they show that they take their environmental responsibility seriously and wish to reduce their environmental footprint. This is an important priority for us as ship owners as well," Walaunet says.

Island Crusader entered into service July 4, chartered to support the rig West Bollsta drilling rig, while Island Contender will support Rowan Viking starting in the spring of 2021. Island Commander is already on contract for Lundin and will keep supporting the drilling activity on the Edvard Grieg field. The new three-year period for Island Com-

mander will start in November.

"We are pleased to be working with Kongsberg Maritime on this endeavor, as a leading supplier and strategic partner to our business," Walaunet says. "By making this investment despite challenging market conditions, we underline our commitment to continue reducing our vessels' environmental footprints, and our strong belief in a sustainable future for our business."

"The operational, financial, and ecological benefits of hybridization-based on our lithium-ion SAVE energy modular energy storage system speak for themselves," adds Gaute Aasen Augestad, Regional Sales Manager (EMEA), Kongsberg Maritime.

"Applying this concept to the PSV market sets an important precedent for the industry, and we're pleased to have been entrusted with delivering this integrated technology package for these Island Offshore vessels."



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Opportunities Gust Off U.S. Shores

By Barry Parker

Throughout the world, offshore wind is on a growth trajectory. With green energy mandates from states in New England and the mid-Atlantic, the U.S. is joining the fray. Consultants Wood MacKenzie, in its U.S. Offshore Wind Outlook 2020-2029, suggested that as much as 25 gigawatts (GW) of capacity could be deployed in the U.S. by 2030 (though estimates range from 14 GW to as much as 34 GW), accounting for a hefty portion of incremental capacity coming online.

Shipyards in New England have already seen the tip of the offshore wind iceberg, with Blount Boats and Senesco having delivered crew transport vessels. The potential is exciting. On a Marine Money webinar in early July, lawyer Charlie Papavizas, from Winston & Strawn, waxed very positive about the prospects for offshore wind, saying, “The major issues are regulatory...how fast that the [projects] could be permitted by the U.S. government as they are all in Federal waters.” He added, “It’s a tremendous opportunity for the vessel industry . . . a lot of Jones Act vessels will be built.” He cited crew transfer vessels, costing at the lower end between \$5 million and \$10 million, as being “perfect for the smaller yards in the United States.” In discussing the more sophisticated special operation vessels (SOV) with “walk to work” capabilities, he pointed to pricetags between \$50 million and \$100 million.

Peter Duclos, president at the Gladding Hearn shipyard,

in Somerset, Mass., best known for pilot boats and for passenger ferries, told *Marine News*, “We’ve been actively pursuing the windfarm sector, going back more than 12 years since the Cape Wind project. We are closely watching the Vineyard Wind developments. We’ve responded to many Requests for Information from potential vessel operators, and we’ve made numerous proposals.”

Duclos explained that his yard’s “sweet spot” would include CTVs (compliant with right whale speed restrictions) in sizes of 20 to 35 meters, as well as “SATVs” - a hybrid smaller walk-to-work SOV with crew transport and live aboard capabilities. Cape Wind was a project that was abandoned in the face of fierce local opposition; Vineyard Wind is a project now in the final stages of environmental reviews.

For marine and other businesses in the ports along the New England and mid-Atlantic states (many of which have seen reduced business due to 2020’s economic pull-back), this newly emerging market sector has the potential to provide a broad spectrum of new opportunities. In a different study by Woodmac (part of an effort commissioned jointly by a handful of trade associations), the analysts look for 25 GW of U.S. offshore turbine capacity by 2030 tied

to anticipated auctions by the Bureau of Ocean Energy Management (BOEM).

Very traditional maritime businesses will of course benefit from offshore wind activity, but the subsequent operation will benefit other entities, notably on the manufacturing and construction sides of the business. Joe Martens, Director, New York Offshore Wind Alliance (one of the sponsors of the latest Woodmac study), said, “This study documents the enormous near- and mid-term economic benefits that offshore wind energy can provide: more than \$1 billion in revenue to the federal treasury, tens of thousands of jobs and billions in investments in ports, vessels and other infrastructure, at a time when the nation needs it the most. It’s time for the federal government to act with the same urgency as the states.”

According to another study sponsor, the American Wind Energy Association (AWEA), citing results of the

jointly funded analysis, “Total investment in the U.S. offshore wind industry will be \$17 billion by 2025, \$108 billion by 2030 and \$166 billion by 2035. From 2022 to 2035, capital investment of \$42 billion will go to turbine manufacturers and the supply chain, \$107 billion will go to the construction industry, and \$8 billion will go to the transportation industry and ports. Annual capital investment for O&M activities will increase to \$2.4 billion in 2035.” The study looked at the New York Bight, coastal Maine, coastal Carolina, and coastal California.

The involvement of governmental policy and economic



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“The major issues are regulatory...how fast that the [projects] could be permitted by the U.S. government as they are all in Federal waters.”
 – Charlie Papavizas, Lawyer,
 Winston & Strawn

development agencies will also drive the flow of electricity, but also the flows of money. “Local content” is a consideration where the individual states are heavily involved in the procurement of power.

Consider New York, which, in July, issued a tender for purchasing power tied to an April solicitation for between 1 GW and 2.5 GW of power. Included in the solicitation was a financial incentives program, for up to \$200 million (in debt, and in actual grants) that would help fund infrastructure investment in 10 ports. New York’s planners note, “The prioritization of staging and/or manufacturing port utilization necessitates active coordination between projects and eligible ports in order to create real, persistent and sustainable institutional and labor capabilities in New York State, thereby creating long-term economic opportunities and helping to lower the cost of future offshore wind projects.”

The spirit and legal language of local content looms large all along the coast, as offshore wind ramps up. In New Jersey, the state will be investing \$300 million to \$400 million in the New Jersey Wind Port (on the eastern shore of the Delaware River), a project with a 2026 completion date. It aims to support \$500 million of annual economic

To serve the offshore wind vessel market, Senesco acquired the capability to build with aluminum. It is building a CTV for sister-company WindServe Marine, which has the contract to operate the vessel for Ørsted.



Senesco

OFFSHORE WIND

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Further south, the developers of Marwind, an inchoate wind project offshore Ocean City, Md. (which recently saw an equity investment from private equity giant Apollo Global Management), will be required to invest \$110 million into a steel fabrication facility and port upgrades at the Tradepoint Atlantic shipyard. The yard, formerly known as Sparrows Point, was, at one time, a leading builder and repair facility for deepsea vessels owned by Bethlehem Steel.

Later this year, in a pilot project Ørsted and Dominion energy will be generating power from two turbines offshore Virginia Beach (a precursor to a much larger 2.6 GW project). Virginia's Department of Mines, Minerals and Energy (DMME) had launched a Port Readiness Study in

"This study documents the enormous near- and mid-term economic benefits that offshore wind energy can provide: more than \$1 billion in revenue to the federal treasury, tens of thousands of jobs and billions in investments in ports, vessels and other infrastructure, at a time when the nation needs it the most. It's time for the federal government to act with the same urgency as the states."

– Joe Martens, Director,
New York Offshore Wind Alliance



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Pictured: Capt. Murchison - 80' Patrol Vessel for Texas Parks & Wildlife Department

2015, with the Commonwealth hoping to serve projects throughout the mid-Atlantic.

For now, the turbine installation vessels, with capabilities to lift up to 1,500 tons, are not Jones Act compliant; foreign flagged vessels are used. Another trade group the AWEA was active in removing “Jones Act waiver” language from a House version of the National Defense Authorization Act (which covers the U.S. Coast Guard) that would have slowed down contracting of the foreign flagged, non-Jones-Act-compliant installation vessels slated to work in U.S. waters. AWEA urged Congress not to move in the direction of such rules (since there are no Jones Act compliant installation vessels, which “take years to manufacture and cost hundreds of millions of dollars”), saying, “Offshore wind will mean business for U.S. mariners and vessels—at least 18 different kinds of vessels are needed to construct and maintain an offshore wind farm, and U.S.-flagged vessels are available for the vast majority. Tugs,

barges, crew transfer vessels, feeder barges and more are all abundant U.S. ships that offshore wind will put to work.”

Rules on Jones Act matters (for offshore oil and gas, and now offshore wind) continue to be a muddy area. Papavizas, who heads Winston & Strawn maritime practice, wrote, regarding a mid-July ruling by Customs & Border Protection (that was subsequently withdrawn, illustrative of the confusion), “In the ruling, CBP confirmed the well-understood maxim that a foreign installation vessel can install wind tower components so long as the vessel is stationary and does not ‘transport’ components but is provided those components from shore via Jones Act qualified ‘feeder’ vessels.”

As offshore wind advances in the U.S., a long history of offshore oil and gas will provide a guide path. Just as drilling rigs moved from fixed positioning (jack-ups) to floating (drillships and platforms), so too will offshore wind turbines. At a media briefing held in conjunction with the Business Network for Offshore Wind’s International Part-

Dry bulk shipowner Scorpio Bulkers recently signed a letter of intent to purchase a newbuild wind turbine installation vessel (WTIV) as a “first step in a transition towards a sustainable business in renewable energy”. Scorpio said it expects to sign a \$265-\$290 million shipbuilding contract with South Korea’s Daewoo Shipbuilding and Marine Engineering (DSME) in the fourth quarter of 2020. The deal would include options for up to three additional vessels.



Scorpio Bulkers

nering Forum, Liz Burdock, the group's president, said, "Where we see an opportunity is in the floating technology space...". Noting her Network's mission of tying together disparate players, Burdock added, "It's also a great technology that can incorporate our oil and gas supply chain... that helps [offshore oil and gas participants] move into offshore wind."

There are other business angles. In early August, a NYSE-listed shipping company closely followed by the U.S. investment community, Scorpio Bulkers, recently announced that it would be pivoting toward investment in multiple offshore wind turbine installation vessels, to be built in South Korea, with prices of circa \$265 million to \$290 million each. A sister company in the Scorpio Group has already had a foray into oil service vessels.

At this time, the big installation vessels will come from elsewhere; but crew transport vessels are already here and service vessels are looming on the horizon. At end 2019, the American Bureau of Shipping (ABS) granted an approval in principle (AIP) for a Vard-designed SOV that could be built in the U.S., with a another AIP for a second SOV design announced in early August. Darren Truelock, Vice President, Vard Marine Houston, said, in a Vard release, "The U.S. market seems to be moving quickly starting on the East Coast, so a purpose-built U.S. offshore wind Jones Act fleet is inevitable."

Marine News asked Gladding Hearn's Duclos for his views on likely operators of such vessels, and he suggested that "We have spent a lot of time gaining an understanding of who the 'right' customers are. The logical operators are folks already in the Jones Act business. They could be tugboat owners and passenger vessel operators, but certainly they could also be folks who are operating OSVs in the oil patch."

Data from Clarksons Platou Renewables, included in Scorpio Bulker's offshore wind announcement, suggests that the number of turbines installed in coastal waters around the world will double from around 7,200 presently, to more than 15,000 in 2025 and 27,000 in 2030. Presumably, a healthy portion of these will be sited in U.S. waters, and serviced by U.S. built vessels.

Duclos offered a big picture view: "The U.S. maritime industry is ready to respond. We have the capabilities . . . look what we can do . . . just look out the window in New Bedford, or in the U.S. Gulf." On timing, he suggested, "It may take a year until we see an operator come in. Somebody needs to get out in front; it may be a speculative order, but it will come with a very big payoff."

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PIONEER CREW TRANSFER VESSELS:



Atlantic Wind Transfer's newest CTVs have been designed by Chartwell Marine.

Chartwell Marine

DESIGNING THE U.S. FLEET

By Eric Haun

Europe has been the clear leader in offshore wind power since the world's first offshore wind farm was built off the coast of Denmark in 1991. Now, as regions in Asia and North America set out to harness the huge energy potential gusting off their shores, local firms are drawing from the expertise laid out in the well-established European industry as they build the foundations for new offshore wind markets of their own.

It's no surprise, then, that designs for offshore wind support vessels currently being built in the U.S. come from the other side of the Atlantic. One of these is the Chartwell

24 crew transfer vessel (CTV), from U.K.-based Chartwell Marine, currently under construction for Atlantic Wind Transfers at Blount Boats in Warren, R.I.

Introduced in 2018, the Chartwell 24 is gaining popularity, with a number of references from European firms such as Seacat Services and High Speed Transfers.

Here in the U.S., AWT, based in Quonset Point, R.I., will use its new Blount-built Chartwell 24 to provide Jones Act compliant offshore marine support services for the Coastal Virginia Offshore Wind (CVOW) project, the first offshore wind project in U.S. federal waters, being de-



Chartwell Marine

veloped by Richmond, Va.-based Dominion Energy.

The connection between Chartwell Marine and AWT extends beyond the most recent vessel order. Chartwell Marine's managing director, Andy Page, was previously head designer at South Boats, the company that delivered the design for AWT's (and the United States') first CTV, Atlantic Pioneer. The 21-meter vessel was also built by Blount Boats, and delivered to AWT in 2016, originally under contract with Deepwater Wind to service the country's first offshore windfarm off the coast of Block Island, R.I. The all-aluminum catamaran is currently under long-term contract with Ørsted, who has taken over ownership of the Block Island Wind Farm.

After three years operating the U.S.' first purpose built offshore wind service vessel, AWT turned to Page and members of the Chartwell team behind the Atlantic Pioneer to design for the firm's next two CTVs, the first of which, Atlantic Endeavor, is scheduled to go straight to work for Dominion Energy upon delivery later this year.

AWT's new vessels will be a specialized version of the Chartwell 24, adapted to the unique operational conditions and environmental regulations of the U.S.

Page notes several key differences between CTVs built for U.S. and European waters. For one, the underwater profile of the U.S. version has been modified to operate safely in wavelengths and swells along the U.S. Eastern

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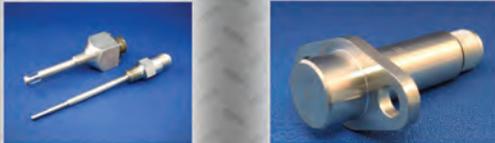


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Chartwell Marine

Seacat Weatherly is a Chartwell 24 CTV recently delivered to Seacat Services in the U.K.

Seaboard that are typically longer and larger than what's seen in the North Sea. From a compliance perspective, the designer also considered emissions standards variances as well as U.S. legislation protecting the migration route of the protected right whales.

The Chartwell 24 is designed to be adhere to both IMO Tier III and EPA Tier 4 emissions requirements. "EPA Tier 4 requirements in the U.S. mean that any engine greater than 800 horsepower (hp) requires a scrubbing system (selective catalytic reduction, or SCR, system) that reduces nitric oxide (NOx) and sulfur oxide (SOx) emissions as the engine burns fuel," Page says. "In Europe, we currently follow IMO Tier II which is roughly equivalent to EPA Tier 3. However, from January 1, 2021, IMO Tier III, which has emissions reduction requirements that are equivalent or slightly higher than EPA Tier 4, comes into play."

In the U.S., EPA Tier 4 allows for as many less-than-800

hp engines as desired without after treatment, so a quad arrangement with two 799 hp engines per hull has become popular, Page says. In Europe, IMO Tier III applies to all combustion engines greater than 130 kilowatts (approximately 174 hp), meaning the quad arrangement won't be possible from January 2021 without SCR. "We were very mindful of that when we developed the Chartwell 24 in the first place," Page says. "We wanted to make sure the boat was ready for that arrangement, and it was also ready for IMO Tier III and EPA Tier 4 SCR units."

In the U.S., all vessels 65 feet (19.8 meters) or longer must travel at 10 knots or less in certain locations along the U.S. East Coast at certain times of the year to reduce the threat of vessel collisions with endangered North Atlantic right whales. Page says the Chartwell 24 is available in a right whale compliant version that's just under 65 feet long, as well as a full-length version in excess of 80 feet



Chartwell Marine

"I think our Chartwell 24 will be one of the main markers and will form the backbone of a lot of operations in the United States."

– Andy Page,
Managing Director of Chartwell Marine

(24.4 meters). AWT's first of two new CTVs currently under construction will be the smaller version.

"When we developed our Chartwell 24 design, we wanted to make sure that from a buildability and an operator's fleet perspective that the ingredients—be it the engines, fuel system, seats and wheelhouse—were identical regardless of whether you went for the 65-foot right whale compliant vessel or the full size," Page adds. "This means that if you're trying to build a fleet of CTVs, as an operator you can have commonality of parts, your ergonomic and aesthetic image is the same, the controls are in the same place, the heads are in the same place, etc."

Interestingly, Page says many of the learnings gained from designing vessels for U.S. requirements have been helpful in European waters, demonstrating that the flow of expertise travels both ways.

"We've taken in mind some of the U.S. Coast Guard re-

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Atlantic Wind Transfers' Atlantic Pioneer is the first U.S.-built and -operated offshore wind farm crew transfer vessel.

Atlantic Wind Transfers

quirements—some of which are perhaps better developed than European standards—and use them to help influence our designs over here. And equally, in some areas the European standards are slightly higher,” Page says. “It’s been really good for research and development, and this has helped us to innovate what we believe is a good all-around solution.”

In addition, Chartwell has benefited from taking its designs, including the Chartwell 24 and the new 30-meter CTV design developed with BAR Technologies, to ABS for approval in principle. And, having now built several boats in the U.S., Chartwell has been able to leverage the

unique experience and skills of American boatbuilders to improve its European designs.

Impactful technological advances are taking place on both continents, and Page says the amount of innovation happening in the industry makes today a good time to be a naval architect. Two key CTV design trends he identified are helping to continue the industry’s journey toward decarbonization while also offering efficiency gains and operational advantages.

The first is the use of battery or alternative fuel cells for all or some power for propulsion and house loads, which



Chartwell Marine

BAR Technologies and Chartwell Marine have received approval in principle from ABS for the design and construction of a BAR 30-meter CTV aimed for operations in the growing U.S. offshore wind sector.

Page says is steering the way his firm designs boats. Diverse Marine in the U.K. is currently building a Chartwell-designed hybrid diesel/electric CTV for High Speed Transfers. A fairly sizable diesel engine, 400 kilowatts of electric power and two large lithium ion battery banks will enable the vessel to operate electrically, on diesel or both. “From a capex perspective, there is a current slight premium, but it’s not where it was five years ago. But in terms of opex, your engine hours and service time will reduce significantly,” Page says. In addition, reduced fuel use and the ability to optimize vessel operations with multiple power options—either through machine learning or manually—will create further cost savings, he adds.

The other key trend Page highlights is the use of underwater appendages to increase lift and reduce drag. Chartwell has partnered with U.K.-based BAR Technologies to use foils to reduce vessel displacement, lifting the vessel out of the water to minimize vessel surface area. “Less resistance means less power required to operate the vessel at speed,” Page says. “A combination of these two will provide the best possible vessel solution at the moment.”

Page believes the U.S. holds many opportunities for his naval architecture firm, which in addition to the CTV pair under construction at Blount Boats, currently has a commercial fishing boat, several survey vessels and noncommercial high-latitude exploration yachts in build stateside.

In the years to come, Chartwell Marine’s opportunities should only grow alongside demand for a fleet of Jones Act CTVs to service the wave of new wind farms expected to be developed in U.S. waters.

“I think our Chartwell 24 will be one of the main markers and will form the backbone of a lot of operations in the United States. There will also be a requirement to go further offshore and stay offshore longer, and therefore in deeper swells, so I think there is a requirement for larger platforms—be it 30 or 50 meters—both as crew transfer style and accommodation vessels,” Page says. “But I’m also mindful that the cost of construction is higher in the States than it is in Europe, and it’s significantly higher than Asia. So, it may be required that service operation vessels (SOV) will be needed in some areas, but also where they’re capex prohibitive there will be opportunities for CTVs like our BAR 50-meter vessel, a fast light craft using further hull form technology to make it comfortable at zero speed for seakeeping.”

“The demand, we assume, will follow similar traits to what it has in Europe and what it’s growing to be in Asia, and there will be plenty of boats to go around in various yards in the U.S.,” Page says. “It takes a lot of investment, both time and money, but I think the long-term requirement—and let’s not forget the wind availability in the States—will mean that it will come to fruition.”

Outfitting the Modern

Atlantic Endeavor

Offshore wind crew transfer vessel (CTV)

Builder: Blount Boats

Designer: Chartwell Marine

Owner: Atlantic Wind Transfers

Flag: U.S. Jones Act Compliant

Under construction: Scheduled for delivery in November 2020

Offshore workers: 24

Crew: 2-3

This is Atlantic Wind Transfers' second crew transfer vessel built at Blount Boats. The purpose-built CTV will be delivered and commissioned straight into service providing operations and maintenance support for Dominion Energy's Coastal Virginia Offshore Wind (CVOW) project. The two Siemens Gamesa 6MW turbines were installed this past June approximately 26 miles off the coast of Virginia Beach, Va.



Hull type: Catamaran

Hull construction: Aluminum

MAN engines

Cummins generators

ZF transmissions

HamiltonJet waterjets with AVX Controls

Drive shafts built by Driveline Service of Portland

Humphree USA interceptors

Hull length: 64.9'

Beam: 28.4'

Draft: 4.4'

Service speed: 22-24 kts

Sprint speed: 29 kts

Crew Transfer Vessel

Tank capacities:

Fuel: 3,620 gal.
Fresh water: 215 gal.
Grey water: 100 gal.
Black water: 100 gal.

Deck equipment:

Palfinger crane
Nabrico anchor winch
Fwd. deck cargo capacity: 10 mt

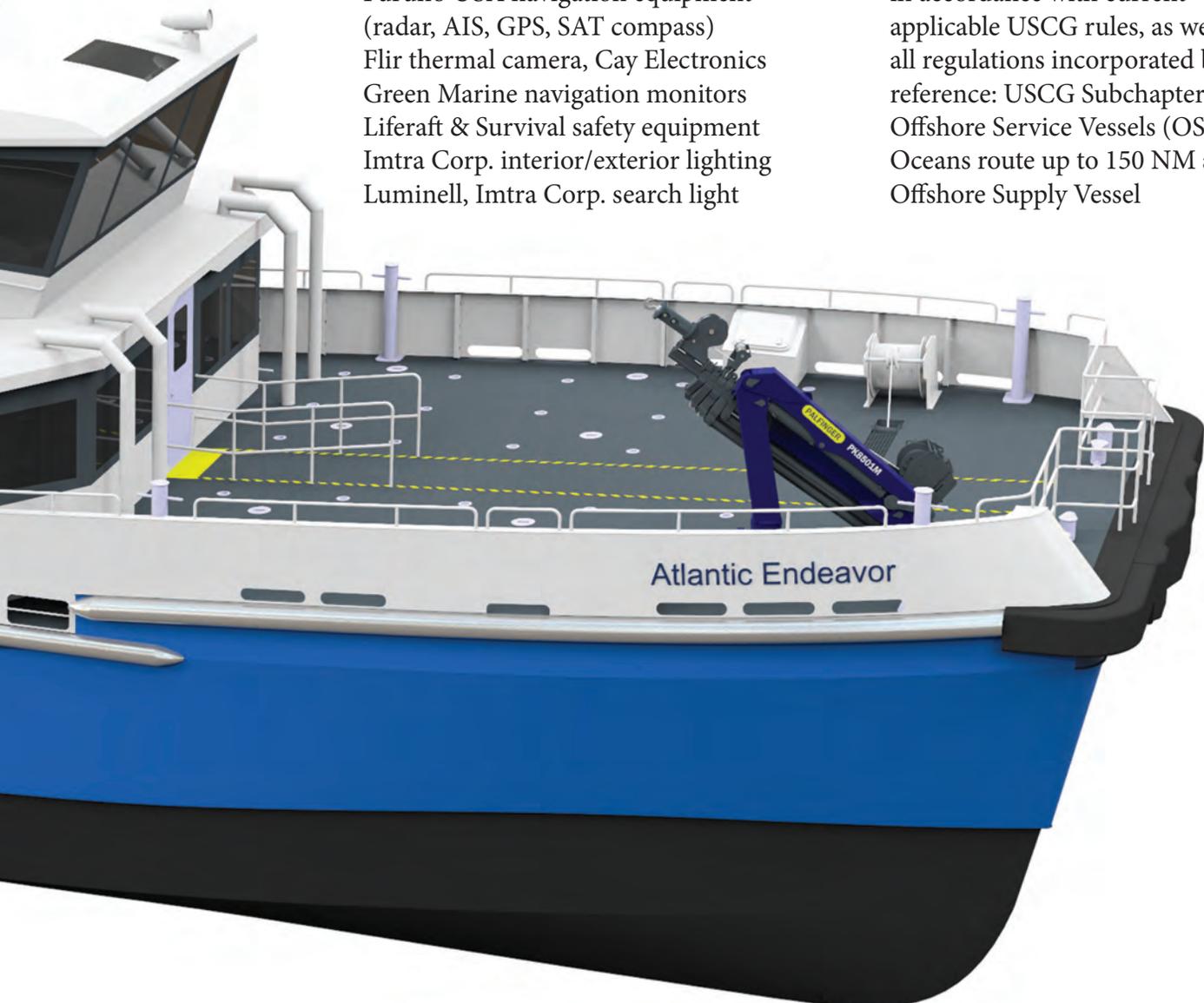
Passenger amenities:

SAT TV & radio
VSAT internet
AC/heated
Restrooms (2)
Wet room/changing/storage

Bee Electrics electrical systems
LopoLight navigation lighting
Furuno USA navigation equipment
(radar, AIS, GPS, SAT compass)
Flir thermal camera, Cay Electronics
Green Marine navigation monitors
Liferaft & Survival safety equipment
Imtra Corp. interior/exterior lighting
Luminell, Imtra Corp. search light

Classification/certification:

The vessel is designed and built in accordance with current applicable USCG rules, as well as all regulations incorporated by reference: USCG Subchapter L for Offshore Service Vessels (OSV); Oceans route up to 150 NM as an Offshore Supply Vessel



Aerial Drones Deliver Offshore



Images courtesy of Ole Jørgen Bratland, Equinor

In August, Norwegian oil company Equinor successfully sent a drone carrying a 3D-printed cargo from shore to an offshore production platform in the North Sea, in what the company says is a world's first. The firm, a long-established leader in the use of remotely operated underwater vehicles (ROV), is now also turning to unmanned vehicles in the skies.

In a flight spanning around 50 miles from the Mongstad base onshore to the Troll field in the North Sea offshore Norway, the drone carried a 3D-printed part for the lifeboat system. The flight took one hour, at an altitude of approximately 5,000 feet.

Drones have been used for a number of offshore and

maritime applications, from vessel, platform and wind turbine inspections, to spare part deliveries for cargo ships and vessel emissions detection off the coast of Denmark. BP is using drones equipped with advanced technology originally designed by NASA for use on Mars to remotely monitor methane emissions from its offshore assets in the North Sea, and Turkey says it has been using drones to hunt for hydrocarbons in the eastern Mediterranean. But Equinor says its latest use is new ground for the offshore industry.

"The flight was a test, the world's first of its kind, where an actual freight operation was conducted over a lengthy distance to an operating offshore installation. The drone was a Camcopter s-100 model, manufactured by Schieb-



el,” the company says.

“Development is rapid, and we see a huge potential within drone technology that could transform the way we operate, both under and above the sea surface. Equinor aims to lead the way in utilizing new technology on the Norwegian continental shelf (NCS),” says Arne Sigve Nylund, Equinor’s executive vice president for Development and Production Norway.

“Drones could reinforce safety, boost production efficiency and contribute to lower CO2 emissions from Norwegian oil and gas. Drones will also play a role as we shape new energy solutions on the Norwegian shelf,” Nylund continues.

According to Equinor, the type of drone that carried out the operation has been thoroughly tested and has logged around 70,000 flying hours from other types of operations within the defense and coast guard services.

The drone is more than four meters long and weighs in excess of 220 pounds. It has a cruising speed of more than 90 miles per hour and it can carry cargo weighing up to 110 pounds.

The operator of the drone is the Sandnes-based com-

pany Nordic Unmanned.

“Equinor and the drone operator have enjoyed good cooperation with the Civil Aviation Authority, Avinor Air Navigation Services and the Norwegian Communications Authority in completing this ground-breaking transport operation,” Equinor says.

“Over the longer term, we expect to see new infrastructure for logistics and support operations, which can reinforce what we already have within vessels and helicopters,” says Alena Korbovå Pedersen, who heads the work on developing logistics solutions in Equinor.

“If we are to develop the logistics solutions of the future on the Norwegian shelf, where drones could play an important role, we must cooperate across all of the industry’s players; operating companies, suppliers, the authorities and the trade union and safety interests,” Pedersen continues.

Several other firms are already onto the trend. In May this year, Dutch Drone Delta (a consortium promoting the use of drones), the Port of Rotterdam Authority and Allseas coordinated a pilot project to determine whether drones could increase transport efficiency in the Port of



Rotterdam, making a successful test delivery to Allseas' giant offshore construction and decommissioning vessel *Pioneering Spirit*.

"As a provider of technical services to the offshore industry, we are continuously pushing the existing technical boundaries. *Pioneering Spirit* is an example. With this pilot, we want to test whether drones could be an effective means to quickly and efficiently deliver materials to our vessels. Helicopters, for example, are not always available in every location. Drone delivery can be of added value when we are in urgent need of parts which we can't repair ourselves—for example network switches or computer chips," says Allseas' public relations manager, Jeroen Hagelstein.

Shipping, logistics and marine services provider GAC has teamed up with a Singapore-based start-up F-Drones to work to develop large-scale drones that can deliver up to 220 pounds of supplies over 60 miles to vessels and offshore platforms. Testing is currently underway on F-drones' third prototype.

In addition to conducting logistics operations, Equinor says airborne drones can also be used for inspections and observations of the technical condition of our offshore installations and onshore facilities.

"They have extremely advanced camera equipment and can be used in search and rescue operations, for example to locate people who have fallen into the sea, or for early detection of pollution on the sea. These abilities were also tested during yesterday's flight," the company says.

Separately, drone company Scout Drone Inspection

and DNV GL that have been working together to develop an offshore autonomous drone system to cut inspections costs, and to increase safety. In June, DNV GL said a piloted drone had successfully inspected a 64-foot-high oil tank onboard a floating production, storage and offloading unit (FPSO) owned by Altera Infrastructure, formerly known as Teekay. The partners believe autonomous drones could soon be used for tank inspections on offshore installations, with data immediately analyzed by artificial intelligence (AI).

Equinor agrees drones will also play a role among a host of new energy solutions on the NCS.

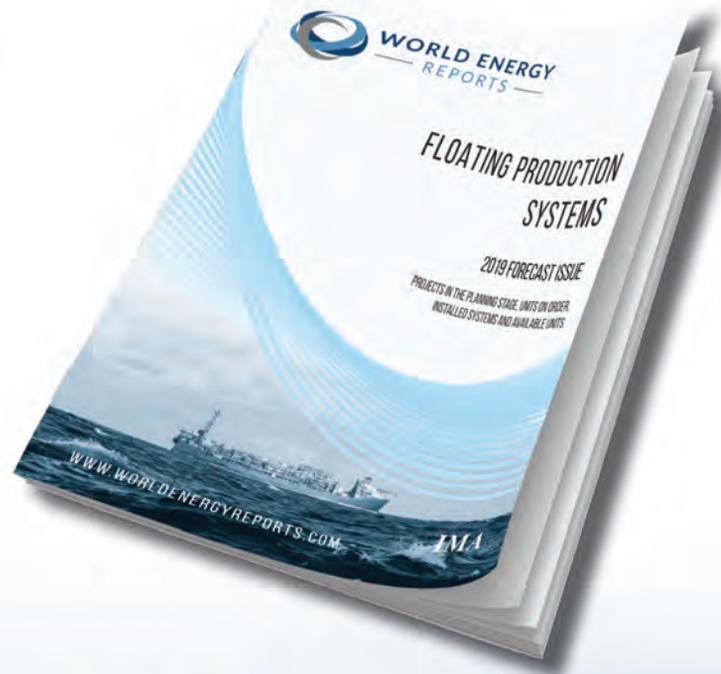
"Drones can inspect wind turbines, deploy equipment to be used by personnel performing maintenance and repairs, and they can deliver critical parts, fast. Using drones will also enable us to avoid some vessel lifts that can be both more costly and leave a greater environmental footprint," the Norwegian energy giant says.

"The fact that we chose a 3D printed part for our first drone transport offshore was a very natural choice. 3D printing is another rapidly growing technology that will transform the way we work. The part we transported was a diesel nozzle holder—a critical component in the lifeboats on *Troll A*.

"The part is no longer manufactured and is difficult to obtain. Therefore, the part was redesigned and modeled in 3D before an advanced metal 3D printer produced a replica in a sturdy, industrial alloy, Inconel 718. The part was manufactured quickly, and was delivered safely and efficiently to *Troll A*, Norway's largest gas producer."



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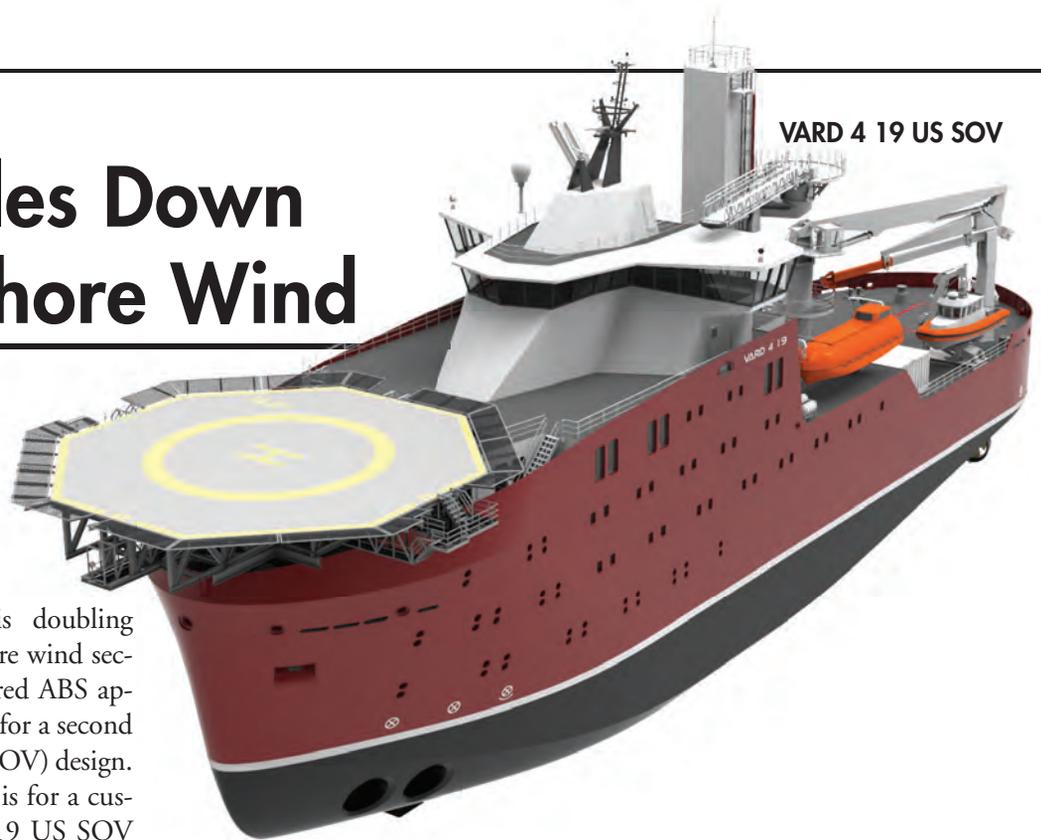
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Vard Doubles Down on US Offshore Wind

Images courtesy of Vard



VARD 4 19 US SOV

Vard Marine (VARD) is doubling down on the U.S. offshore wind sector, having recently secured ABS approval in principle (AIP) for a second Jones Act service operation vessel (SOV) design.

The AIP awarded in June 2020 is for a customized version of the VARD 4 19 US SOV and follows an AIP for the VARD 4 07 US SOV granted in December 2019 – the first AIP awarded for a Jones Act SOV.

The latest, larger SOV variant, like the first, is designed for functions including accommodation, transferring technicians to installations as well as storing spare parts and tools for operations in U.S. offshore wind farms.

SOVs are unique vessels, purpose-built for the deployment of heavy-duty components and the accommodation of offshore support and maintenance engineers. As such, they need to be highly adaptable, capable of offering transport, a hotel, a warehouse and a workshop.

A purpose-built SOV typically requires a higher level of comfort so that turbine and other technicians can stay onboard and work efficiently for up to a month at sea. The vessel may need to stay on station for several weeks at a time, using dynamic positioning systems.

“With our track record in SOV and offshore-vessel designs, and ABS’ record in the offshore sector, working together to deliver this project seemed like a natural fit,” Darren Truelock, Vice President, for VARD Marine (Houston) said in a release announcing the AIP. “We already have experience supporting yards worldwide to construct our offshore vessel designs, so it is with great enthusiasm that we now start on this exciting journey with ABS in the U.S.”

During the AIP process, ABS assessed the vessel general arrangement, the mid-ship section and the ship’s prospective outline specifications for the class notations that were

requested by VARD, and to ensure the design was compliant with ABS Rules, including U.S. supplements to those rules.

Both vessels will have the ABS Class notations + A1, OFFSHORE SUPPORT VESSEL (WIND-SC), +AMS, + ACCU, DPS-2, HAB(WB.).

In particular, part of the assessment criteria from ABS’s Guide for Crew Habitability on Workboats focuses on five categories that can affect performance of the crew in the challenging SOV workplace; each can be controlled, measured and assessed in work, rest and recreation areas of workboats. The categories cover the design of the accommodation area, whole-body vibration (there are separate criteria for accommodation areas and work spaces), noise, indoor climate and lighting.

From talking to the developers, VARD recognizes that the technician is at the heart of wind-farm operations, and that their ability to remain sharp at work can depend on the sea-keeping performance of the SOV.

VARD said it continues to independently invest resources in Jones Act fit-for-purpose SOV designs in part to accelerate the design schedule for new construction as the burgeoning U.S. offshore wind industry begins to take off.

“We believe that the U.S. offshore wind market holds several promising opportunities for U.S. owners, designers and shipbuilders,” Truelock said. “The U.S. market seems to be moving quickly starting on the East Coast, so a purpose-built U.S. offshore wind Jones Act fleet is inevitable. This creates some challenges for U.S. designers

and shipbuilders since the necessary SOVs need to be under construction now to support the developer's schedules. Delivery schedules and price points over the next year will be tested and squeezed in order to bring the right vessels online at the right time and within budget.

"VARD is focusing on the U.S. SOV market since these vessels are within our expertise, and we can leverage our extensive Jones Act knowledge of the U.S. offshore service vessel (OSV) market in addition to our existing industry relationships and with shipbuilders."

According to VARD, its SOVs are engineered to be environmentally friendly with a focus on low fuel consumption and ease of construction. The hull forms are designed for all weather conditions, together with the specified propulsion configuration, offers economical steaming, enhanced seakeeping abilities and excellent station keeping performance, the company said, adding that the vessels are optimized to reduce motions and accelerations in all degrees of freedom with the aim to increase operability and comfort.

The offshore wind sector is starting to blossom in the U.S., especially on the East Coast, where the developer community seems increasingly com-

mitted to creating a successful market. And while the market holds several promising opportunities for U.S. designers and shipbuilders, VARD says several challenges exist.

For one, the SOVs and larger jack-up construction vessels needed to build and service the offshore wind fields will need to begin rolling off the slipways at U.S. shipbuilding yards very soon.

In the interim, a number of existing Jones Act offshore support vessels may be candidates for conversion to serve the wind industry; VARD plans to support owners and shipbuilders with these modifications, which in turn will help developers to fill the gaps until bespoke vessels are built.

However, as the size of wind turbines continues to grow, only so much can be achieved through conversion; extra-large, purpose-built vessels will need to be built as soon as practicable, or brought over from abroad to support the wind-farm construction.

Like ABS, VARD is an international company with the global experience to bring the lessons learned overseas from the growing pains of the offshore wind markets to bear in the U.S. Both have extensive SOV experience and can leverage their knowledge of the Jones Act, the OSV market and relationships with

shipbuilders to support the safe expansion of this fast-growing energy sector.

"ABS is supporting innovation in the development of alternative-energy systems all over the world and it is a real pleasure to be helping to deliver such important vessels here in the U.S.," said Matthew Tremblay, Senior Vice President, ABS Global Offshore.

ABS has long supported technical innovation for marine wind-power assets. This experience includes the classification of Seajacks Scylla, the world's largest offshore construction vessel designed specifically to support offshore wind farms. Working with the University of Maine's Advanced Structures and Composites Center, ABS is also supporting the development of innovative concepts for future floating wind-farm projects.

VARD 4 07 US SOV



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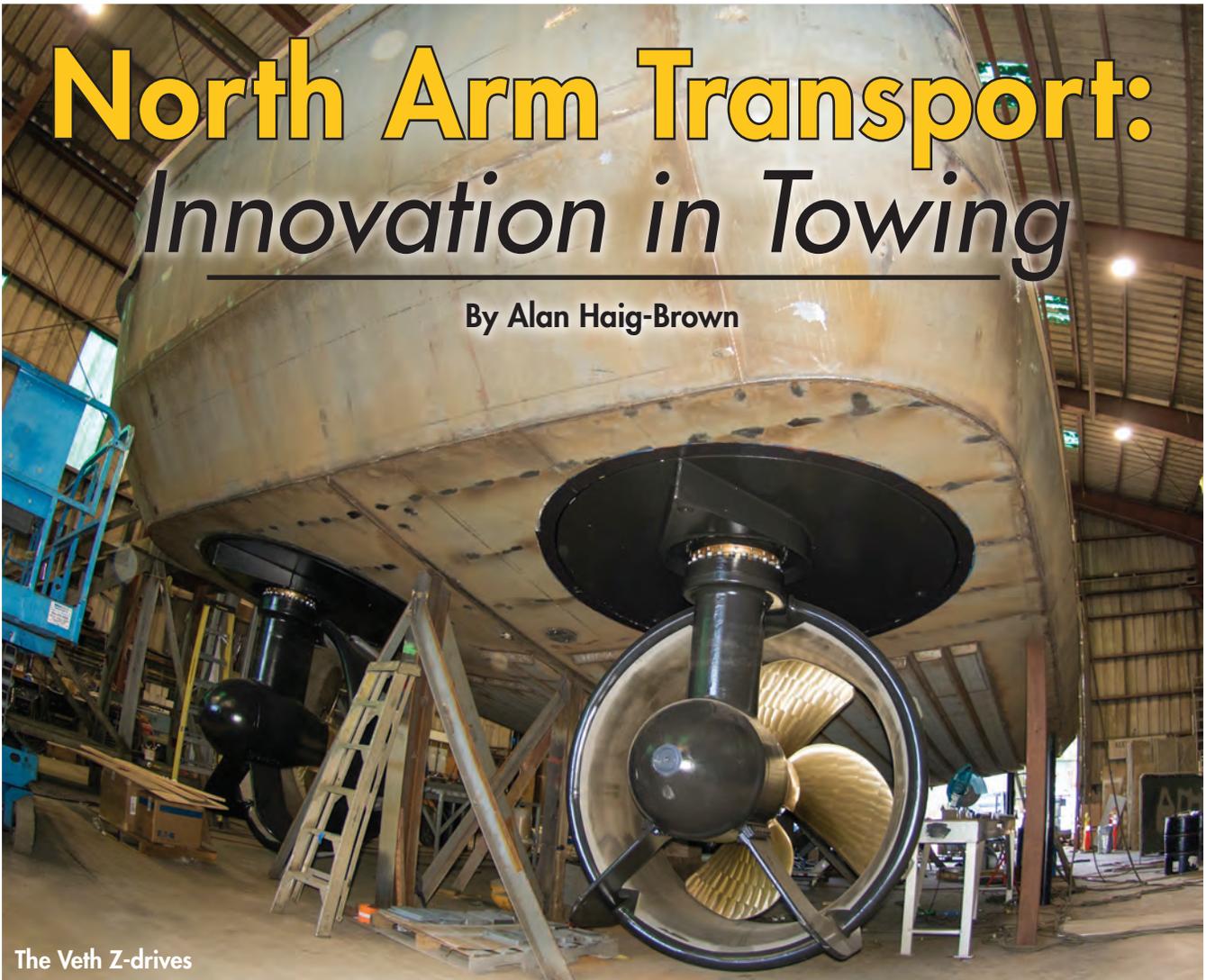
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North Arm Transport: *Innovation in Towing*

By Alan Haig-Brown



The Veth Z-drives

Founded in 1958 as an extension of the Stradiotti family businesses, North Arm Transportation has grown to be a significant fuel company on the B.C. coast. Over the years, the company fleet has expanded and evolved. With tugs in a range of size and power, as well as cargo and fuel barges, the company services the coast out of its headquarters in Vancouver on the North Arm of the Fraser River. They also have facilities on Mitchell Island in the Fraser and at Masset on Haida Gwaii. Much of their work entails deliveries of fuel and heavy equipment to locals with water only access in the inlets and on the islands of the B.C. coast.

This work, especially when fuel is involved, requires powerful and reliable tugs. The company is currently building an A.G. McIlwain designed tug that will provide a still greater level of safety. The new 64-foot nine inch by 17-foot (19.736 X 8.23-meter) tug is well along at ABD Boats in

North Vancouver, they anticipate a January 2021 launch, with the name North Arm Tempest. Gino Stradiotti, said, “We’ve had a lot of discussion with Jack Davies, owner of the Z-drive tug Renegade, a sister to our new boat, about the design and about towing. While he has outfitted her, with a towing winch I do not know if he has had much opportunity to use her for work other than ship docking.”

With few exceptions, all tugs towing barges on the B.C. coast are fitted with conventional propellers in nozzles. The new North Arm tug is being fitted with a pair of Veth Z-drives. This will make the boat capable of assisting with ship handling, but importantly, it will also be able to more safely maneuver its own barges in isolated up-coast ports. Stradiotti explained, “We work in remote areas, without much access to assist boats. A lot is on the hip, taking the barge into the beach or bulkhead. Part of the thinking was to take a page from Bob and Russell Shrewsbury’s book at



Paul Kruse and Burton Drody checking the engine mounts

Western Towboat in Seattle where they use Z-drives for towing. They face similar challenges in Alaska albeit with a lot bigger tugs and barges. They were very generous with their operational thoughts.”

A split-drum, combination anchor and hawser winch by Burrard Iron Works, is mounted forward. While a single drum towing winch from Burrard is mounted on the aft deck. Both winches will operate on hydraulics off the two auxiliary engines. Towing pins were supplied by Western Machine Works.

Power for the two Veth drives will be a pair of Cummins KTA38-M main engines, each producing 1,000 horsepower at 1,800 revolutions per minute. The engines will drive the Z-drives through Vulkan torsional flexible couplings and composite shafts. Port and starboard drive units are housed in separate spaces accessed by a passageway aft of the engine room. North Arm’s Fleet Supervisor Paul Kruse has had extensive experience with Cummins engines and, the KTA38 in particular, in the past with Vancouver-based Island Tug and Barge. He is a strong advocate and notes, that “These are mechanical engines, and have worked well in the Renegade. To address environmental and economic concerns we have fitted them with optional fuel monitors.”

The role of Z-drives on towing vessels along the west coast will be sparking a lot of interest among those looking to upgrade their fleets. In BC, North Arm Transportation is leading the way with the North Arm Tempest.

An advertisement for The Maritime Network. At the top left is a white anchor logo on a dark blue background. To its right, the text "THE MARITIME NETWORK" is written in white, bold, sans-serif font. Below this, on a light blue background, is the text "The maritime industry's largest group" in a dark blue, italicized font. Underneath that is the phrase "JOIN → TODAY!" in large, bold, red letters, with a white arrow pointing to the right. To the right of this text is the LinkedIn logo, a white "in" inside a blue square. Below the LinkedIn logo, the text "Connect with more than 148,000 members" is written in a dark blue, italicized font. At the bottom of the advertisement is a photograph of a red tugboat with yellow lights, sailing on a blue sea under a clear sky.

OCIMF Publishes Guidance on DP System Failures

Images courtesy of Kongsberg Maritime

In 2002, following a series of offshore vessel incidents in the U.K. North Sea, industry concerns were raised about the safety and reliability of dynamic positioning (DP). A comprehensive review by the U.K. Health and Safety Executive revealed that guidance was not being implemented or adhered to consistently across the supply chain.

Aiming to improve the assurance of DP system failure mode and effects analysis (FMEA) quality, a new information paper published by the Oil Companies International Marine Forum (OCIMF) sets out how relevant information should be presented, in a prescribed format. ‘Dynamic Positioning Failure Mode and Effects Analysis Assurance Framework, Risk-based Guidance’.

A large group of industry stakeholders including, classification societies, vessel owners and DP industry bodies worked together to develop the guidance. “This information paper on the assurance requirements for FMEAs was a broad industry collaboration and will improve safety in the industry and serve as a means to align the spectrum of diverse stakeholders,” said Faisal Rashid, Technical Advisor at OCIMF.

One of the companies involved in developing the guidance, DNV GL’s Noble Denton marine services, has

launched new support to help vessel operators to understand and implement the new guidelines.

“Unlike previous attempts to improve DP FMEA standards, the OCIMF information paper is not intended to provide guidance on the execution of DP system FMEAs. There is already a significant amount of guidance on this already available from recognized bodies,” said Steven Cargill, Technical Authority for Dynamic Positioning, DNV GL - Oil & Gas. “The difference is that the new guidelines seek to gain improvement by providing a detailed set of technical requirements on the presentation of key elements of the DP system for the purposes of vessel audit.”

OCIMF members choosing to implement the information paper will seek to gain compliance with its requirements while delivering DP vessel services.

It is anticipated that the task of preparing and submitting the document to OCIMF will not prove to be onerous for vessel owners who already have a DP system FMEA aligned with industry best practice. In some instances, external assistance may be required to meet the requirements, and DNV GL can assist those having difficulty following the technical requirements.



Kongsberg Launches Remote DPO Training

As the maritime world continues to turn to digital technologies to help maintain business operations amid the coronavirus pandemic, Kongsberg Maritime is increasingly leveraging digital platforms to ramp up remote delivery of targeted training. The Norwegian tech company says it is now offering basic Dynamic Positioning Operator (DPO) courses fully remotely from start to finish, including the practical part of the training.

Using virtual machines, students can engage in practical exercises with a remote K-Pos trainer, in addition to com-

pleting theory and assessment modules online. Kongsberg says the hands-on experience is fully compliant with the DNV GL DPO preparation course and is the first remotely-delivered DPO training ever to be approved by The Nautical Institute for their DP Induction course.

DPO courses are often requested by ship owners on behalf of their trainees, and also by self-sponsored candidates. By enabling students to complete the course from their home or office using cloud-based K-Pos trainer consoles, Kongsberg is making training more accessible by removing both the disruption and expense caused by traveling, it says.

Delivery of remote training—already a focus for Kongsberg Maritime—has been accelerated by the COVID-19 health crisis and is likely to become the main method of training in the future, the company says. Applicable to all vessels and industries using DP, the course material is made available online, with competence assessments at each stage provided either by Kongsberg or by a third party.

Kongsberg's DP Digital Survey App Gets Bureau Veritas Approval

Kongsberg Maritime has received approval in principle (AIP) from Bureau Veritas (BV) for its Dynamic Positioning Digital Survey (DPDS) application, meaning BV is now allowing vessel owners and operators to conduct DP Annual trials using the app.

Kongsberg says that its DPDS application digitizes all the data derived from the DP Annual tests, carried out in accordance with IMO MSC Circ 1580 guidelines and IMCA M 190, to verify the performance and redundancy of the vessel-specific DP system. This encompasses the complete installation necessary for dynamically positioning a vessel, comprising, but not limited to, power system, thruster system, and DP control system.

The BV AIP comes after two years of development and trials, including last year's pilot trials, conducted by Kongsberg with the assistance of offshore service provider Bourbon Offshore. Kongsberg Maritime says it has also used this time to prepare and equip for widespread delivery.

Per Kongsberg Maritime, the DPDS application provides access to data acquired directly from the DP system. The data is transferred to class surveyors via Kongsberg's secure cloud infrastructure upon completion of the trials. The surveyor can then play back the DP Annual trial program onshore, based on the high-quality DP data accumulated. Each test is unique and can be played back individually. Surveys can be carried out at any time from any location once the data is uploaded to the cloud.

No more paper

"This data-driven aspect of the application is of particular value for ship owners, who can use the digital survey tool to collate and present concrete evidence that the nec-

essary test procedures have been carried out and completed," Kongsberg explains.

"Thanks to maintenance management system interfaces and tamper-proof image upload functionality, the test visualization provided by the DPDS application is far superior to the paper-based evidence collection—complete with photo and video recordings—which has tended to act as the industry norm for many years," the Norwegian tech company said.

"The benefits of the DPDS application to vessel owners are numerous," says Egil Haugsdal, President, Kongsberg Maritime. "The digital survey tool enables substantial savings to be made because far less time needs to be spent off-hire, and it obviously removes the requirement to cover travel expenses for surveyors. It can also improve crew competence, simplifying DP Annual trials and making the approval process far more efficient and straightforward.

"Furthermore, as the application is essentially an add-on to our existing K-IMS application suite, it's easy for vessels to integrate and deploy DPDS."

AIP not issued lightly

Bureau Veritas' own progress in the digitalization of surveys has seen the development of an additional BV class notation, DDPS (Digital Dynamic Positioning Survey), an addition to the existing DYNAPOS notation.

Laurent Leblanc, Vice-President and Marine Operations Director, Bureau Veritas, says, the DPDS application has met BV's stringent criteria to demonstrate compliance in principle with the BV additional class notation DDPS.

"It should be very apparent that BV approval is not issued lightly," Leblanc says. "The quality, detail and security of the transferred data have to meet our exacting standards, and we're satisfied to confirm that the KM DPDS application fulfils its function admirably."





ZEA

AT THE HELM

*Checking in with Waterways Council, Inc.'s new president and CEO
Tracy R. Zea*

By Greg Trauthwein

To start, give us some insight on your background and how you came to lead WCI.

I was born and raised in Chandler, Ariz., and attended South Dakota State University, receiving a degree in Political Science. After college, I found my way to Washington, D.C. via an internship with Senator Thune (R-S.D.). After the internship, I was hired by the House of Representatives, Transportation and Infrastructure Committee. During my time with the Committee, I served in various positions, but the one that relates the most to my position as Waterways Council, Inc. President/CEO is my time on the Water Resources and Environment Subcommittee. During my time on the Subcommittee, I played an integral role in the enactment of the Water Resources Reform and Development Act (WRRDA) of 2014. In 2015 I joined WCI as Director of Government Relations. In this position I advocated for WCI's priorities with Congress, the Administration, and the Corps of Engineers.

Please describe the shape and size of WCI's membership today.

WCI is comprised of a diverse membership of approximately 165 members, primarily operators, shippers, organized labor and conservation groups.

What are your top priorities as you begin your new role at WCI?

To continue achieving legislative victories that will advance the modernization of the inland waterways system. There has been significant progress made on the inland waterways transportation system since 2014, but there is a real opportunity in the Water Resources Development Act (WRDA) of 2020 to enhance and modernize the system for years to come. WCI's top priority is to achieve a cost-share adjustment for construction and major rehabilitation projects on the inland waterways.

Much of the U.S.' inland waterway infrastructure is in need of maintenance and repair. How dire is the situation, and where do you see most urgent needs?

The Corps of Engineers built most of the nation's locks and dams in the early 20th century, and more than 70% of the lock chambers are, at over 50 years old, past their design life, with an overall average age of 71 years. All the infrastructure require maintenance, and the Corps continues to provide that to the best of the financial resources provided to them by Congress. They do an amazing job to ensure the reliability of the system. Meanwhile, some projects are being modernized. Congress has recognized the need to invest in the maintenance of these structures to provide

operators and shippers reliability. An increase in funding over the last five years for operation and maintenance provided by Congress has also been extremely helpful. Maintenance of critical infrastructure will always remain a high priority across every mode of transportation.

Overall, how would you rate the Trump Administration for its efforts to address inland infrastructure needs? What have been some of the successes and failures?

The inland waterways have several champions within the United States Congress. Congress, regardless of party, has continued to invest in the inland waterways over the last seven fiscal years, whether through the appropriations or authorization process. On the appropriations front, over the last two years Congress has adjusted the cost-share for Chickamauga

Lock to ensure that all four top priority navigation construction projects could receive efficient funding. Efficiently funding these construction projects remains a high priority because it allowed for the Olmsted Locks and Dam project to become operational four years ahead of its “adjusted” schedule. The Lower Mon project is estimated to become operational in 2023, which is four years ahead of schedule. Kentucky Lock is estimated to become operational three years ahead of schedule, and Chickamauga is estimated to become operational four years ahead of schedule. This success will continue or improve if Congress adopts WCI’s top priority of adjusting the cost-share in the WRDA 2020 bill.

Please describe the takeaways (both good and bad) and potential impacts from America’s Water Infrastructure Act 2020?

WCI’s top priority of adjusting the cost-share for construction and major rehabilitation of projects is included in the America’s Water Infrastructure Act of 2020. The cost-share is adjusted to 65% general fund revenue/35% Inland Waterways Trust Fund. If this adjustment is enacted into law, it could potentially provide an additional billion dollars toward construction and major rehabilitation of inland waterways modernization projects. Currently, there are 18 modernization projects that are valued at just over \$8 billion, and by adjusting the cost-share, these projects will significantly be expedited toward completion.



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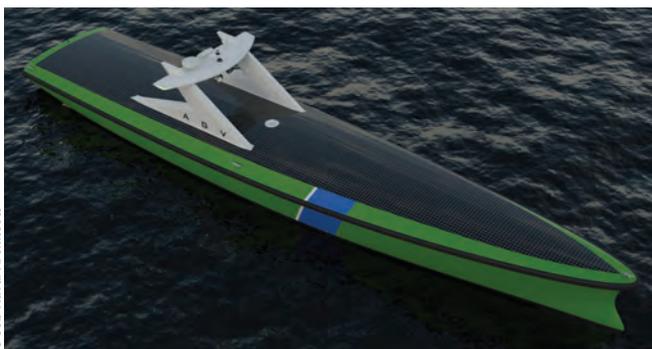
Unfortunately, no business discussion today can be had without discussing COVID-19. Can you provide insight on how this business interruption event has, and will impact inland marine operations?

The inland waterways industry has shown that it is not immune to COVID-19. Significant precautions have been taken by companies to keep their employees safe and healthy. The Inland Waterways User Board announced at its meeting in July that IWTF fuel receipts are down for FY20 as a result of the COVID-related economic downturn. The receipts were tracking almost identically to FY19 until February, when we saw almost a flat line. Expected total projections may be significantly lower than FY19.

While much of the chatter around COVID-19 is negative, if nothing else it has illustrated the importance of supply chains and the maritime industry’s role in an efficient, cost-effective means to bring products to markets. From where you sit, is this message getting through to legislators?

As the Department of Homeland Security early pointed out in the COVID-19 crisis, maritime workers are essential. The commerce this nation depends upon moves on the inland waterways in the most cost-competitive, environmentally friendly, traffic congestion-relieving, and safest way. Congressional champions believe in the inland waterways and will fight for it now and in the future.

'Autonomous Guard Vessel' Concept Unveiled



A new offshore guard vessel concept aims to be smaller, lighter and more efficient than most of the vessels used to protect offshore operations currently. It will also be completely unmanned and autonomous. The so-called Autonomous Guard Vessel (AGV) has been created by a consortium of maritime companies specifically for surveillance of offshore structures throughout their life cycle, ranging from wind farms to substation platforms and cable routes.

The concept to replace conventional guard vessels came to life in a project group facilitated by LISA, a community for maritime professionals. The project group resulted in a consortium, which includes C-Job Naval Architects, SeaZip Offshore Service, Sea Machines and recently joined by MARIN and eL-Tec elektrotechniek BV.

Pelle de Jong, Founding Partner LISA, explains, "Guard vessels perform an essential job, however, it is not the most exciting one for crew. Combined with the fact that conventional guard vessels are mostly outdated and thus aren't necessarily the most comfortable let alone sustainable, it can be difficult to find well-trained crew willing to do the job.

"The group set out to improve upon the overall process of securing an offshore area while incorporating sustainable solutions and reducing overall cost. By utilizing the knowledge we have as a group as well as the technology already available, we succeeded in creating a design which does this and more."

The AGV does not require crew onboard, so accommodations can be eliminated from the design and the ship will be considerably smaller. The smaller size creates a number of opportunities, such as using batteries thanks to reduced propulsion requirements. Reduced power and lack of onboard crew leads to lower operational costs.

Rolph Hijdra, Autonomous Research Lead at C-Job Naval Architects, says, "We are pleased we were able to develop a battery-powered design, ensuring the AGV is free of harmful emissions. Additionally, the ship has solar panels across the top which allows for the continuation of navi-

gation and communications in case the batteries run out of power. Contrary to current guard vessels, the AGV will continue to be operational even with rough sea conditions and have minimal underwater noise owing to the smaller size, reduced propulsion requirements and absence of a diesel engine."

The AGV can continuously monitor nearby marine traffic visually as well as via radar and AIS data in any area that needs to be secured. With any vessel that approaches the area, measures will be taken to secure the area in order to avoid collisions and damage to the offshore infrastructure. An intruding vessel can be communicated with and will receive information on how to safely navigate the area as well as being physically escorted away from the site by the AGV. Additionally, the encounter will be recorded to provide video footage in case of any violation or accident.

The consortium envisions an offshore site will need a number of AGVs, which can take turns in monitoring the area and recharging. The vessel will recharge its batteries via a charging station, which can be moored independently or connected to existing equipment onsite. Charging could either be via a cable connection to the on-site equipment such as an offshore transformer platform or locally generated using renewable fuels. Harm Mulder, Operations Manager at SeaZip Offshore Service, says, "The AGVs will be constantly patrolling the area and take turns recharging. One fully charged AGV will remain on standby supporting operations if a situation arises. For example, when an intrusion is detected, one of the AGVs will monitor, warn and escort the intruding ship to safety, while the others continue normal operations. Alternatively, it could take over from a monitoring vessel in case the battery runs out of power."

Conventional guard vessels patrolling offshore structures have few incidents requiring intervention from those on board. For circumstances requiring human intervention, a command center can control the AGV remotely to ensure correct action is taken. In addition, all data collected by the AGV will be sent to the command center.

Frank Relou, Business Development Manager at Sea Machines, says, "Smart vessel technology will have the most significant initial impact on small workboats, such as this guard vessel. The development of autonomous technology for vessel operations are occurring on an international level but namely in niche segments, such as the guard vessel and other examples, currently operating in (with supervised autonomy), marine survey, fire, patrol, aquaculture and offshore wind operations."

Windserve Odyssey CTV Hits the Water



Ørsted

WindServe Marine's offshore wind crew transfer vessel Windserve Odyssey, built by its sister company Senesco Marine, has been launched and embarked for sea trials on the U.S. East Coast. The new CTV will support Ørsted's U.S. offshore wind projects along the U.S. the East Coast.

"After sea trials at Ørsted's Block Island Wind Farm, the Odyssey will travel from Rhode Island to Virginia to join the closeout of construction and commissioning of the Coastal Virginia Offshore Wind project," Ørsted said. "We're happy to celebrate this achievement, which indicates the United States' readiness for offshore wind and Rhode

Island's impressive capability for this type of shipbuilding."

Senesco has traditionally built tugs and barges for the energy transportation industry but has recently delved into aluminum boat construction business. In a recent interview, Mike Foster, Vice President and General Manager at Senesco Marine, said, "What I see is complete difference in the types of things we build, from tugs and barges to offshore wind support vessels and structures. The market has changed, and we have a great opportunity to go after this new market."

Ørsted and WindServe last year entered into a deal to construct two purpose-built CTVs, which will transport personnel for construction, maintenance, and operation from port to offshore wind farms. One of them is the Windserve Odyssey, built by Senesco, while the other is built by U.S. Workboats in Hubert, N.C.

The WindServe Odyssey will join the closeout of construction and commissioning of the Coastal Virginia Offshore Wind project, however, the vessel has been built specifically for Ørsted's and Eversource's Revolution Wind project located off the southern New England coast, expected to be commissioned in 2023.

DLBA Introduces 120' SATV Concept

DLBA Naval Architects, a division of Gibbs & Cox, Inc., has developed a new concept vessel for service in the U.S. offshore wind market. The 120-foot service accommodation and transfer vessel (SATV) is conceived as a possible alternative to traditional North Sea crew transfer vessel (CTV) designs, and has been specifically developed for the U.S. market and concept of operations.

Many U.S. offshore wind projects will be further offshore than the EU counterparts, and the predominant sea states are different. DLBA saw the opportunity to develop a new type of vessel specifically suited for the U.S. market that would reduce the total cost of energy. In the proposed operational model, the larger SATV would make one transit to and from the windfarm fields per week, instead of daily transits. The vessel is sufficiently sized to stay on site for extended periods, and outfit appropriately to allow the service technicians to sleep on board overnight.

DLBA's concept is based on a semi-planing monohull of aluminum construction. Volvo Penta IPS propulsion has been chosen to meet EPA Tier 4 requirements, minimize



DLBA Naval Architects

the frequency of occurrence of loss of thrust when pushing up to stanchions, and ease of replacement to maximize vessel availability. The vessel is fitted with a gyro-stabilizer to limit roll motions—as the monohull is inherently less stiff than a catamaran—to reduce vessel motions and maximize crew effectiveness. The vessel's structure is designed to meet ABS HSC Rules for heavy weather offshore operation.

Harvey Gulf Upgrades PSV to 'Tri-fuel' Vessel



Harvey Gulf

U.S.-based offshore vessel owner Harvey Gulf said it completed an upgrade of its platform supply vessel Harvey Energy, making it the first "tri-fuel" PSV in the U.S.

Harvey completed the installation of a Wartsila battery-power system on the PSV which was already a dual-fuel vessel capable of fully operating on liquefied natural gas (LNG) or diesel. The installation was completed at Harvey Shipyard Services in Port Fourchon, La., with assistance from the Harvey Gulf-owned yard in Gulfport, Miss.

At the same time, Harvey said it had started operations at its new diesel bunkering facility in Port Fourchon, La., pairing it with Harvey's LNG bunkering operations there.

Harvey will also complete the installation of a GE battery-power system on the PSV Harvey Champion in September.

Maritime Partners Takes New C&C-built Towboat

Belle Chasse, La. shipyard C&C Marine and Repair said it has delivered the second vessel in a series of 15 towboats it is building for Metairie, La. based Maritime Partners, LLC.

The new 2,600-horsepower, 84' x 34' towboat Brooks M. Hamilton was designed by Entech Design, LLC, based in Kenner, La., with the 3D modeling and production drawings done by C&C Marine and Repair's in-house engineering department. The design includes two Cummins QSK38-M1 main engines, provided by Cummins Mid-South, that are paired to two Reintjes WAF 665 reduction gears, provided by Karl Senner, LLC. The vessel's steering system HPU was provided by Rio Marine and Hydraulic. The towboat offers a total of six beds. A soft-core joiner system, provided by Marine Interior Systems, was installed in the accommodation spaces for added comfort and fire safety.

According to C&C Marine and Repair, its focus on innovative production methods enabled vessel's accelerated delivery. The use of a Lincoln Electric/Ogden welding



C&C Marine and Repair

panel line assembly seam welder and automatic dart welder allow for the fabrication of panels up to 40' x 100'. The Vernon Tool Company computerized pipe cutting machine allows various size pipe diameters and length to be pre-cut prior to assembly to avoid adjustments and cutting in the field. The use of 50-ton overhead gantry cranes improve efficiency and increases production throughout the building process. The shipbuilder said it is able to avoid weather delays thanks to five enclosed production bays which house all new construction activity within a controlled environment.

US Wind Farm Support Vessel Gets Bow Extension



DLBA Naval Architects

A bow extension will allow Cape Henry Launch Services' workboat Delta Escape to push up against offshore wind turbines to support the Coastal Virginia Offshore Wind (CVOW) pilot program off Virginia Beach, Va.

Naval architecture and marine engineering firm DLBA Naval Architects, a division of Gibbs & Cox, said it was recently engaged to complete the structural design for the project.

The bow was built out of aluminum and added on to the existing aluminum hull structure. The DLBA team created the push knee appendage using Finite Element Analysis (FEA) to predict the stresses in the structure ensuring it was sufficient to withstand the loads imparted by the wind farm structure on the bow of the craft in heavy seas.

Metal Shark Delivers Patrol Boat to the DR



Metal Shark

Metal Shark delivered an 85- by 19.5-foot welded aluminum Near Coastal Patrol Vessel (NCPV) to the Dominican Republic's Navy under a \$54 million U.S. Navy contract to produce up to 13 Defiant-class patrol craft for U.S. partner nations.

Christened Betelgeuse, in keeping with the Dominican tradition of naming military vessels after constellations, the new patrol craft was built at Metal Shark's Franklin, La. shipyard and officially incorporated into the Dominican Navy during a ceremony at the Las Calderas Navy Base on August 6.

The NCPV is a monohull vessel utilizing the parent-craft hull form of Damen Shipyards' 2606 Standardized Patrol vessel, which has been optimized by Metal Shark to

suit NCPV requirements. The vessel is designed to support a wide range of missions including search and rescue, border patrol, police and customs duties, counter-narcotics operations and securing waters of economic importance.

Powered by twin 1,600-horsepower Caterpillar C-32 marine diesel engines turning fixed-pitch Michigan Wheel propellers through Twin Disc MGX-6599 transmissions, the NCPV has been designed for missions of up to six days at sea in nearshore ocean conditions, supporting an operating crew of 10.

The NCPV carries a 5.6-meter Metal Shark-built aluminum RIB, powered by twin Mercury 50-horsepower four-stroke outboards, that quickly launched and retrieved via an integrated stern slipway.

PEOPLE & COMPANY NEWS

OBITUARY



Philly Shipyard's Leathers Passes

Philly Shipyard announced the unexpected death of its chief financial officer, Brian Leathers, age 60. "It is with great sadness that we share the news of Brian's passing, and our entire organization mourns his death. Brian was a well-respected colleague and friend to many. His positive energy, enthusiasm, and dynamic personality will be sorely missed," said Steinar Nerbovik, Philly Shipyard President and CEO.

Leathers joined Philly Shipyard in early 2019 as the company's strategy and compliance officer before assuming the CFO role in July 2019.



Zea



Malen-Habib



Brown



Socha

Zea Takes the Helm at WCI

Waterways Council, Inc.'s (WCI) Board of Directors unanimously elected Tracy R. Zea as the organization's new President and Chief Executive Officer. Zea joined WCI as its Director-Government Relations in August 2015, and was most recently WCI's Vice President-Government Relations. He has a broad range of Capitol Hill, policy development and government relations expertise.

WCI Senior Vice President Deb Calhoun had been serving as the organization's Interim President/CEO, effective February 18, after President and CEO Michael J. Toohey announced plans to retire.

Malen-Habib Named ASA President

Lindsay Malen-Habib has been named president of the American Salvage Association (ASA), becoming the first woman to assume the role. She is currently Resolve Marine Group's manager of client services, and has been an active ASA member for more than 10 years, having most recently served as ASA secretary-treasurer and vice president.

Brown to Succeed Marsh as LR CEO

After 14-years at Lloyd's Register (LR),

including five years as group CEO, Alastair Marsh announced he is stepping down from his role and will retire from the group board on December 31. Nick Brown, LR's current Marine & Offshore Director, will succeed Marsh as group CEO and join the LR group board on January 1, 2021.

Socha Joins Conrad Shipyard

Conrad Shipyard has hired Robert A. Socha to lead the company's sales and marketing efforts as vice president of sales and marketing. He was most recently senior vice president for business development at Halter Marine following previous roles at Mid-Gulf Shipping Co, Baker Marine Solutions, Bollinger Shipyards and Tidewater Marine.

Henshaw to Lead Connecticut Port Authority

The Connecticut Port Authority (CPA) approved the appointment of John Henshaw as its new executive director, effective September 8. He was previously the executive director of the Maine Port Authority for over 10 years after serving as commissioner for the Board of Harbor Commissioners for the Port of Portland.

PEOPLE & COMPANY NEWS



Henshaw



Galloway



Holmes



Demant and Georgieva

Galloway to Lead Harvey's New Subsea Venture

OSV operator Harvey Gulf International Marine has appointed Ed Galloway to manage its new subsea venture company, Harvey Subsea Services. Galloway was previously Director of GoM Region at Subsea 7/i-Tech 7.

Holmes Joins Bureau Veritas

Class veteran Daniel Holmes joins Bureau Veritas as Business Development Manager, North America, operating from the Miami office. He is a naval architect graduate and his considerable experience will support Tim Protheroe Regional Chief Executive, North America, and the BV teams.

Leadership Changes at Svitzer

Towage operator Svitzer announced Lise Demant will leave her role as global CCO and take up the position of managing director for Svitzer's Europe region, succeeding Kasper Friis Nilaus, who was recently appointed CEO of Svitzer A/S. Also, Vidolina Georgieva will succeed Demant as global CCO and enter Svitzer's global leadership team.

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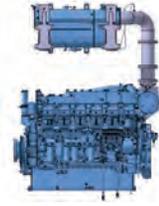
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TracVision TV10 Antenna

KVH Industries, Inc. launched the newest marine satellite TV antenna in its TracVision series. The 1-meter ultra-high efficiency TracVision TV10 provides the biggest coverage footprint in KVH's TracVision series and is designed to provide boat owners, charter yacht guests and commercial vessel crews with access to live news, local channels and TV and movie programming from leading satellite TV providers worldwide. The TracVision TV10 supports HD and SD programming from circular and linear Ku-band services around the globe. Crews can choose from an array of popular satellite TV programming services including DIRECTV, DISH Network, Bell TV, SKY, Canal+, TrueVisions, Orbit Showtime Network (OSN), DIRECTV Latin America and more.



Mitsubishi S12R Tier 4

Mitsubishi Turbocharger and Engine America (MTEA) introduced Mitsubishi's new mechanical controlled, EPA Tier 4, 1,260-horsepower heavy-duty marine propulsion engine. The Mitsubishi S12R Tier 4 is a 49-liter, V-12, 1,260-horsepower marine propulsion engine operating at 1,600 rpm. While the engine offers simple mechanical controls and big displacement, it utilizes SCR technology in meeting the NOx Tier 4 emission requirements. The S12R-Y4 engine has met Tier 4 certification requirements and is available for order now.



M-series Azimuth Thrusters

Schottel introduced its new M-series azimuth thrusters, consisting of several medium-sized rudder propeller sizes covering a power range of 400 to 1,000 kW. With the M-series, Schottel says it aims to meet new challenges such as shifted engine power classes, updated ice class rules and an ever-increasing number of electric or hybrid-driven vessels. The azimuth modules are available for Z-drives, L-drives and ZY-hybrid drives, making them suitable for horizontal electric, vertical electric or combined direct engine plus horizontal electric motor connection.

JMR-61 River Radar

Alphatron Marine introduced the JMR-61 river radar, which it says is characterized by an excellent suppression of wave action on wide water. The radar is suited for extreme weather conditions, using an aerodynamic scanner and an associated modified motor. Offered in two different fully dimmable monitors, the JMR-611 is said to be the first river radar to meet the stricter requirements for maximum reflection from radar monitors. Available are the standard 19 inch LED monitor, without protective glass with the familiar black aluminum front, or the modern all-glass 19 inch LED monitor, with the LED panel optical bonded to the glass for maximum performance.



Marine LED Floodlight

Phoenix Lighting has introduced the Sturdilite Master Series - a low-voltage LED floodlight for installation on pilot, fire and patrol boats. The Master Series is IP69K rated and features a super heavy-duty, stainless steel harp to withstand significant and continuous shock and vibration. The durable yet compact fixture has been tested for frequency disturbances and was determined to not affect radio transmissions. The Master Series comes in two versions - 24W and 48W - that produces up to 2,500 and 5,000 lumens, respectively. The Master Series uses premium Osram LEDs and has a 5000K color temperature.

GX60NX Antenna



Intellian launched the latest in its next generation GX range of antennas: the GX60NX, designed specifically and now type approved for use with Inmarsat's Global Xpress Ka-band VSAT network. This 65cm terminal, the smallest in the range, completes Intellian's GX portfolio. The GX60NX is suited to smaller commercial vessels, and supports customers across all markets, including leisure and fishing. The Below Deck Terminal (BDT), single cable antenna connection and AptusNX control software are identical to those used for the larger GX100NX, which is already approved. The GX60NX is 2.5GHz Wideband Ka ready, and the BUC is easily upgraded from 5W to 10W if increased upload.

gplink

Block Island Ferry operated by Interstate Navigation Company offers year-round ferry service to Block Island, R.I. It is heavily relied upon for transportation to and from the island, so they need to make sure their vessels are on-time and dependable. gplink enables Block Island Ferry to track their vessel locations and critical engine data, allowing potential engine problems to be identified and repaired before critical failures occur. Recently, Block Island Ferry added gplink to another vessel in its fleet, the 190-foot, 98 gt Anna C. She is powered by Cummins QSK-38, Triple Screw engines.



EverSteel-X

Samson's EverSteel-X rope is designed for semi-permanent mooring, with several new features to improve operational efficiency, lifetime and safety. Proprietary coating technology brings superior abrasion resistance, permanent twist identification and a patent-pending end-for-end indication to this high-visibility rope. EverSteel-X is suited for permanent jetty mooring with POSA approval from Bureau Veritas. It is also MEG4 tested and certified through ABS. This line offers the highest UV-resistance, and the highest fatigue performance of all Samson mooring lines, and contains Dyneema DM20 fiber.



ABS App

Classification society ABS launched a new suite of fleet management and vessel compliance services powered by its smart functionality and advanced analytics which will also be available through a new mobile app. An enhancement to the ABS My-Freedom client portal, the new portal and digital tools are designed to simplify access to operational, technical and compliance fleet intelligence and all ABS Class services to manage fleet operating health and performance. The ABS App is now available from the Apple App Store and Google Play.

Pyrocrete 341

Carboline has launched Pyrocrete 341, the next generation in cementitious passive fire protection. Pyrocrete 341 is a high density, exterior grade cementitious fireproofing product designed for maximum protection and proven performance. It is UL 1709 rated for up to 4 hours of hydrocarbon fire protection and has 30 minutes to two hours of jet fire resistance. This product rapidly develops strength and provides maximum durability for onsite or offsite applications. It is manufactured using only the highest quality raw materials, with strict QA/QC protocols all under the UL follow up service.



SONARAY LED Lighting

SONARAY LED Lighting manufactures robust, durable, salt-resistant, LED flood lights in sizes ranging from 30-watts up to 1,000-watts, for brown and blue water applications. Recently the firm outfitted a commercial vessel in Alaska with LED flood lights at a color temperature of 2200K. This was a special build and met a very unique challenge – one of being able to cut fog for the vessel. We combined the necessary beam angle along with the color temperature to provide the crew with a safe and effective means to navigate what could be a very treacherous environment.

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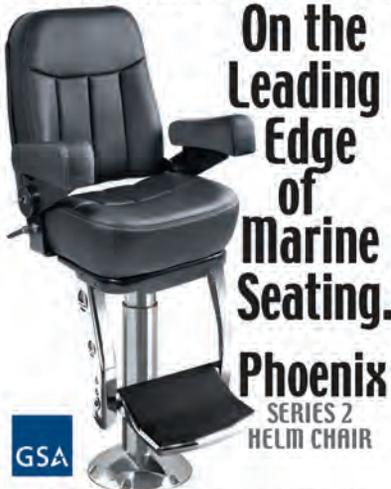
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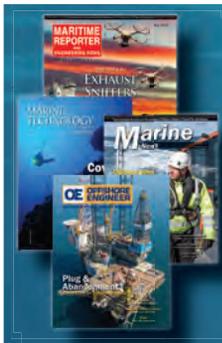


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