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Marine News

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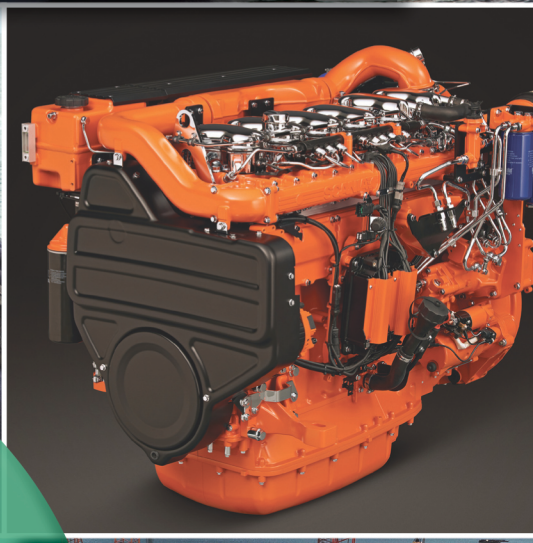
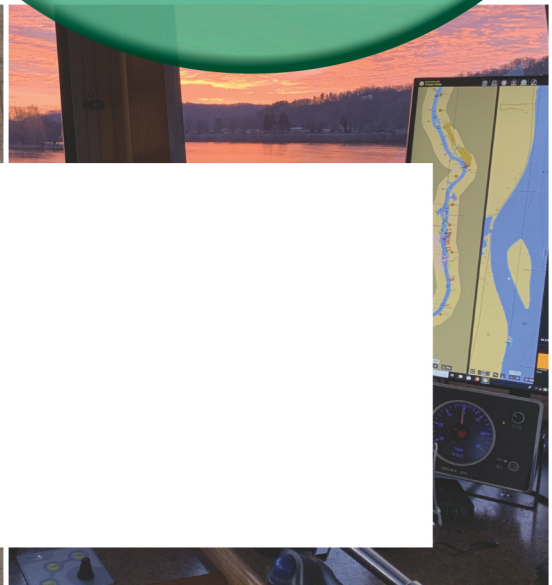
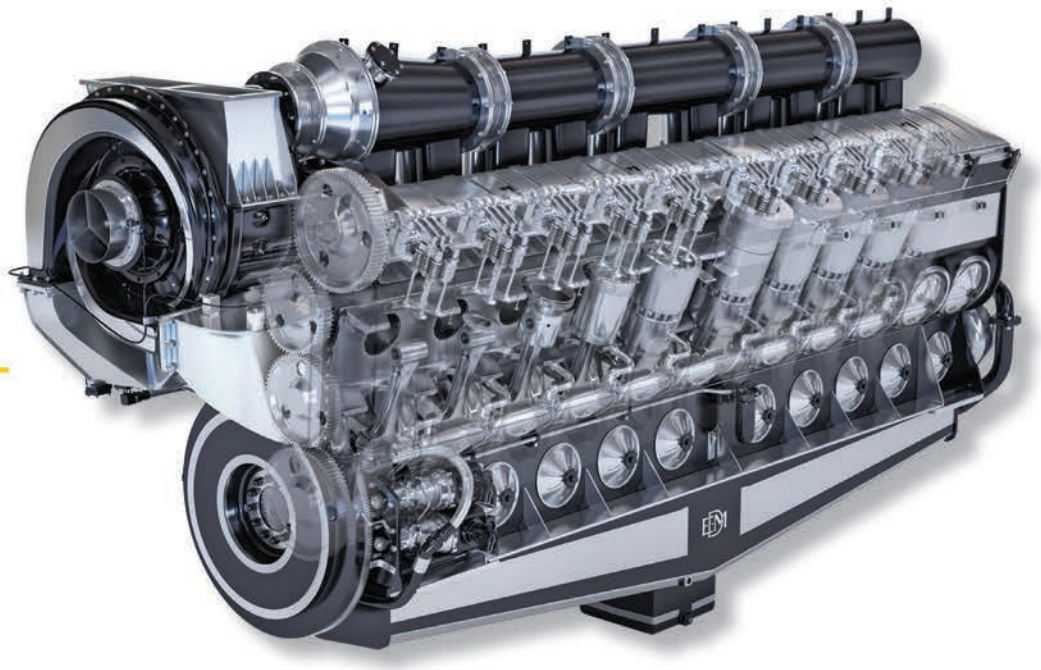


MN 100



Marine Systems, Inc.



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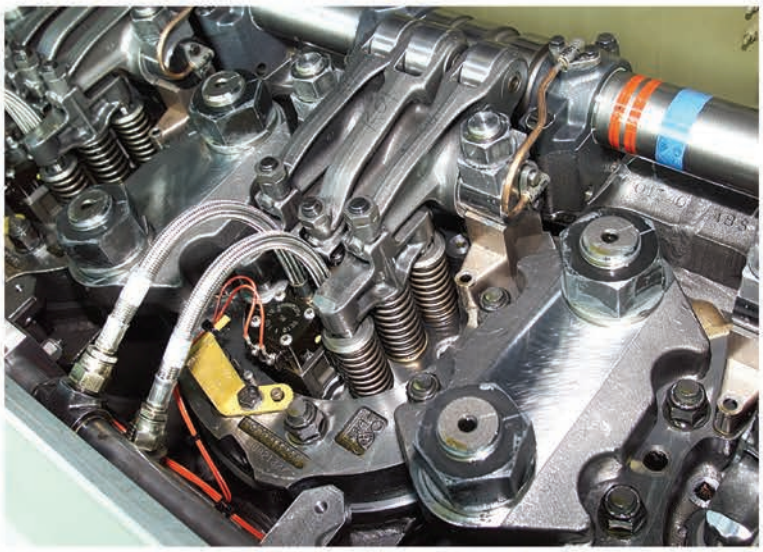

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Editor's Note

Eric Haun, Editor,
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Welcome to *Marine News*' annual MN100 awards edition. Once per year since 2014 we've published an issue highlighting 100 of the leading companies serving the North American shallow draft market, from the most prolific shipyards and successful operators through the long and winding list of manufacturers and service providers vital to keeping them in business. It's an honor to once again present 100 companies that, for one reason or another, stand out among the industry's best.

Longtime *Marine News* readers will notice some new names on this year's list alongside many familiar ones that are still innovating and finding success in today's shifting market landscape. A large portion of the 2021 MN100 companies are among those making a strong push into the U.S. offshore wind industry, which is now ramping and will provide significant opportunities for decades to come. It's truly exciting to see what's in store.

The task of creating the MN100 issue becomes more difficult with each passing year, as the number and quality of entries continues to grow. Many factors are taken into account as part of our selection process, but the first and most important requirement is that companies must to apply to be considered. I sincerely thank all who did. Unfortunately, all can't make the cut, but I encourage those who missed this year to try again in 2022.

As always, thank you for reading.

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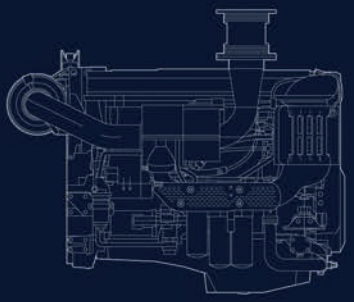

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“

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JON L. DASLER; PE, PLS, CH

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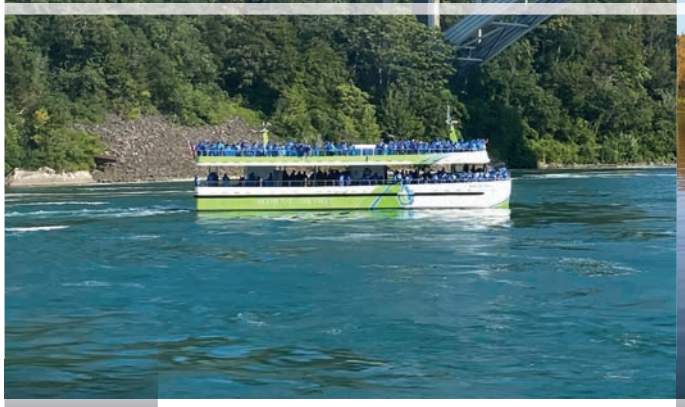

ABB

ABB is a technology leader that is driving the digital transformation of industries, operating in more than 100 countries with about 144,000 employees. The company has provided electric and hybrid systems on board vessels for more than 110 years. In fact, today, well over 1,300 ships employ ABB's electric system. In the shallow draft segment, ABB offers electrical, hybrid, propulsion and automation solutions for vessels such as towboats, dredges, tugs, marine construction and ferries.

In 2019, Niagara Falls tour operator Maid of the Mist decided to replace its fleet with two new ferries. It selected ABB Marine & Ports to provide zero-emission technology, making Maid of the Mist the very first fully electric newbuild ferry ever constructed in the U.S. Each of the vessels is powered by a pair of battery packs with a total capacity of 316kWh, split evenly between two catamaran hulls. The ferries will charge between every trip while passengers disembark and board the vessels. Shoreside charging will only take seven minutes, allowing the batteries to power the electric propulsion motors capable of a total 400kW (563 HP) output.

Following the Maid of the Mist project, ABB was selected by American shipbuilding company Vigor Fab LLC as the hybrid-electric propulsion and energy storage system provider for the newest additions to the Washington State Ferry fleet, setting the largest U.S. ferry system on course for zero-emission operations. ABB is driving toward the next generation of ships, which it believes will be electric, digital and connected, as the industry moves toward new energy sources and autonomous ship operations. And this future is slowly becoming a reality in the United States.

BAE Systems

BAE Systems' Power and Propulsion Solution business area has been on the forefront of clean power and propulsion with a market-leading electric drive system. For 25 years, the company have been focused on helping fleets get to zero emissions with electric hybrid, battery electric and fuel cell electric drive systems.

BAE Systems delivers propulsion and power management capability with innovative electrification products and solutions that advance vehicle mobility, efficiency and performance. Its electric drive systems deliver solutions to decrease emissions, reduce fuel consumption and provide a quieter mode of travel. Both its low and zero emission solutions deliver on 25 years of global experience that's backed by an industry technology leader. This year, BAE Systems is introducing its next-generation electric drive system featuring game-changing power electronics advancing efficiency, increasing flexibility, while decreasing size and weight.

BAE Systems' HybriGen Power provides electric power to vessel accessories, HybriGen Power and Propulsion provides electric power and propulsion for the vessel, and HybriGen Assist that combines a traditional driveline with the benefits of electric-hybrid for a 'boost' in performance.

BAE's systems are safe and reliable, with more than 14,000 systems in operation globally, and the company's products are made in America and U.S. Coast Guard approved. Notably, BAE Systems proven electric drive system is powering the United States' first hydrogen fuel cell powered ferry, the Sea Change, recently launched by All American Marine.

BAE Systems' Power and Propulsion Solutions business area is headquartered in upstate New York. The 165,000 sq. ft. facility is home to the company's electric drive sys-

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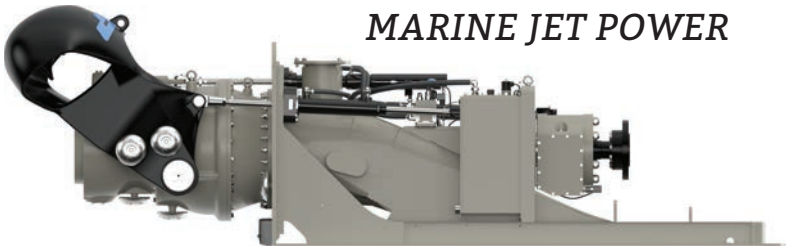
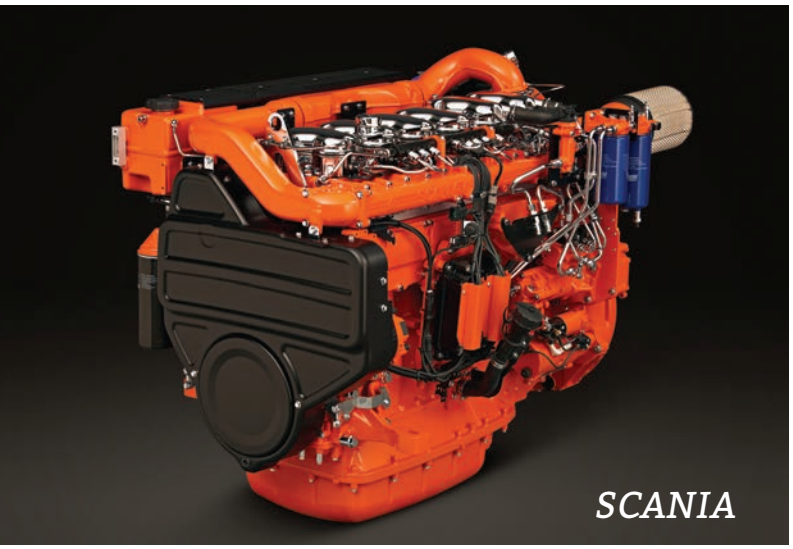


MARINE JET POWER



SCANIA

tem design, testing and manufacturing. Applications engineering and service personnel are supporting European and Asian customers out of BAE's Rochester, U.K. facility.

Cox Powertrain

Cox Powertrain is a British design and engineering innovator of diesel engines developed for marine applications globally. Led by ex-Cosworth CEO, Tim Routsis, whose background lies in engine development in global automotive, aerospace and marine markets, the company's mission was to deliver a completely new concept in diesel engines that has the potential to revolutionize the marine market. With a strong pedigree in Formula 1 racing and premium automotive design, Cox's team of engineers has decades of experience in combustion engines and understands the many challenges customers face. Cox's first diesel outboard performance engine, the CXO300, delivers the same performance and packaging of a gasoline outboard but with the fuel efficiency and reliability of a diesel inboard.

Charles Good, Cox Powertrain's chairman, said the company has recently made a major step with the commencement of serial production of the CXO300 in Shoreham, U.K. at the end of May 2020. "We've transitioned from being an early stage startup—effectively a startup development business—to a full-blown manufacturer, supplying product to a truly global market. This has involved a big shift in culture, skillsets in our organization, as well as the development of a number of commercial relationships around the globe on the supply side, and even more extensively on the sales side, through our distributors, which we've amassed across five continents."

But the road from development to manufacturing and sales wasn't an easy one, Good said. "Undoubtedly, the greatest single challenge was the powerhead—getting the weight down, the package size to something comparable with a petrol outboard."

"Conceptually, we wanted the diesel outboard to be as interchangeable, both in terms of installation and use, as a gasoline outboard, and no more complex," Good explained. "That was a big, big challenge getting the weight out and the package size down meant looking at every single component from a blank sheet of paper and seeing how we could maintain its strength, but to do it with a minimum weight."

Cox now has hundreds of engines operational in 21

countries, across five continents, with capacity to produce 4,000 units per annum. And in 2020, the engine achieved EPA Tier 3 approval, giving Cox Powertrain the green light to ship its production outboards to the U.S.

Marine Jet Power

Marine Jet Power (MJP) was founded in 1986 and delivered its first ever set of waterjets in 1987 to the M/S Cinderella. Today, you can still find the M/S Cinderella operating in the Stockholm Archipelago. Nearly 35 years later, with original MJP waterjets still in operation, the 350-passenger ferry operates a daily schedule from Central Stockholm to Sandham Island in Sweden. Recent advancements include the 2018 launch of the company's next generation of waterjets, the X-Series which earlier this year was expanded up to size 500, accommodating vessels up to 40-meters in length or 2070 kW engine power.

For 35 years, MJP has designed and built the finest waterjet propulsion systems in the world. As a full-service propulsion solutions provider, MJP provides world-class customer support from initial design and build to delivery and custom aftermarket solutions. The company's diverse product line is well suited for multitude of applications ranging from governmental, landing crafts and work boats to high-speed passenger vessels and luxury yachts. MJP's duplex stainless steel, mixed-flow waterjets, the CSU and DRB lines, are durable and efficient and can be customized to project specifications, while the aluminum, actual-flow UltraJet range is well suited for smaller applications. The newly designed X Series—now available in 400, 450 and 500—is the next generation of waterjet propulsion, combining performance and efficiency resulting in a premium pump that provides more power in a lighter unit, burning less fuel and extending range over comparable alternatives. This completely re-imagines waterjet is ushering in a new era of waterjet propulsion performance. Customers asked for speed and MJP delivered the X-Series. With an optimized mixed flow pump capable of speeds in excess of 50 knots. Built from duplex stainless steel this unit is stronger, lighter, more efficient and more corrosion resistant to keep vessels on the water and moving faster when every second counts. The new 400, 450 and 500 X feature a fabricated aluminum intake, full classification approval and a PTO driven hydraulic pump.

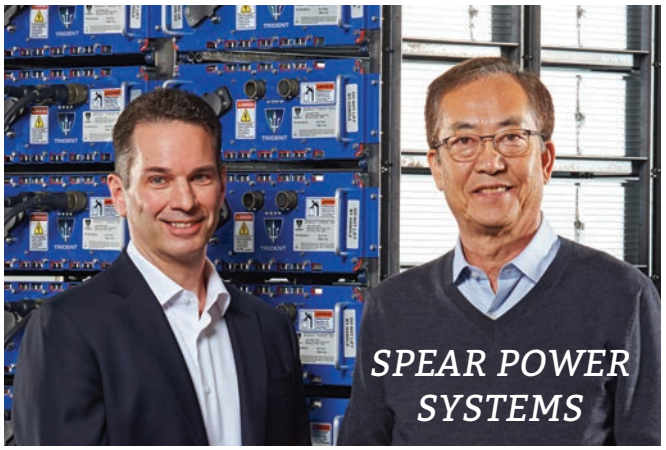
Scania USA

Scania U.S.A. Inc. is a subsidiary of the 130-year-old Scania A.B. and one of the world's leading manufacturers of marine and industrial engines, trucks and buses. In 2020, Scania delivered 11,000 marine and industrial engines, 5,200 buses, as well as 66,900 trucks to their customers. Net sales totaled nearly $14.37 billion, of which over 20% were services-related. Founded in 1891, Scania now operates in more than 100 countries and employs some 50,000 people. Research and development are concentrated in Sweden. Production takes place in Europe and Latin America with regional production centers in Africa, Asia and Eurasia.

Together with partners and customers, Scania is driving a shift toward a sustainable transport system by offering a EPA Tier 3 solution to meet all requirements without the use of after treatment. Scania engines are also suited for hybrid and diesel electric installations because of its high power-to-weight ratio.

Scania offers a complete marine engine concept to meet the toughest demands of reliability, performance and operating economy. The Scania marine platform is comprised of the powerful 16-liter V8 and the robust 13-liter inline engines. The 16-liter V8 engine ranges from 300 - 1,150 hp for propulsion applications, and 430 - 596 kW for auxiliary applications. The 13-liter engine ranges from 250 - 925 hp for propulsion applications, and 269 – 426 kW for auxiliary applications. Scania also offers a robust, IMO Tier II, 9-liter engine for continuous and intermittent applications. The 9-liter ranges from 220-400 hp for propulsion, and 199 kW - 323 kW for auxiliary applications. Engines ratings vary by emissions level. Scania's latest announcement, the availability of its new powerful and lightweight range of engines – fully emissions certified for the U.S. pleasure craft market. A robust line-up commanded by a 900 HP, six-cylinder, 13-liter in-line and an 1,150 HP 16-liter V8. Scania engines are all based on Scania's state-of-the-art modular engine platform, which is used for marine, industrial, power generation, truck and bus applications worldwide. This unique concept with common components enables higher availability, more cost-efficient production, simplified service and maintenance, and efficient training.

Of note, Spindletop, the largest all aluminum pilot boat built in the US., features QUAD Scania DI16 082M en-


SPEAR POWER SYSTEMS


TORQEEDO

gines, producing 800 HP at 2,100 rpm each. Additionally, WindServe Marine's Jones Act crew transfer vessel WindServe Odyssey is equipped with QUAD 800 hp DI16 V8 engines, demonstrating Scania's engine lineup are suited for wind farm service vessels, and offering the flexibility of Tier 3 in multiple continuous and intermittent ratings.

Scania USA recently appointed Laborde Products as the new marine distributor for the Gulf Coast and Inland Waterways Region.

Spear Power Systems

Spear Power Systems' founders, CEO Jeff Kostos and CTO Dr. Joon Kim, both have decades of experience in batteries, having started Kokam America in 2005 to make lithium ion pouch cells in Kansas City. In 2014 they formed Spear to focus on battery integration, and the company has since built a legacy of high-performance custom batteries for the marine, aerospace and defense markets. The 2018 type approval the Trident marine battery system led to explosive growth for Spear, whose batteries power notable vessels such as the United States' first ever all-electric ferry in Gee's Bend, Ala. as well as the nation's first newbuild all-electric passenger vessels at Niagara Falls. Spear's strong market performance has resulted in its forthcoming acquisition by Sensata Technologies (NYSE ST), who will fund the next stage in Spear's growth. The Trident and Spear's Aero products are made in Spear's facility in Grandview, a Kansas City suburb, and the firm has recently opened a facility in Brussels, which will begin battery production in 2023.

Torqeedo

Torqeedo, part of the DEUTZ Group, is a world market leader for electromobility on the water, offering a wide range of electric and hybrid systems, for both commercial and recreational vessels. The company has delivered more than 100,000 electric drives worldwide and is growing at double-digit rates year on year.

Founded in 2005 in Starnberg, Germany, Torqeedo currently has offices in the United States, Thailand and Germany, with a network of dealers in more than 100 countries. Led by president Steve Trkla, the company now numbers 250-plus employees worldwide.

Torqeedo specializes in designing and implementing complex highly integrated fully meshed electric and hybrid systems, providing a complete helm-to-prop solution from a single supplier for vessels up to 120 feet long. Primary market segments are workboats, ferries, excursion boats, water taxis, patrol vessels, lifeboats, research vessels, self-propelled barges, rental fleet operations and utility vessels as well as uncrewed surface vessels (USVs) for a variety of survey applications.

Major recent installations and projects during the past 12 months include a fleet of 20 47.5 ft fiberglass passenger ferries for Bangkok, rental boats in Washington, DC, a new aluminum utility vessel deployed on Scotland's Loch Lomond, aluminum passenger ferries in Spain and France, and a fleet of long-range crewless hybrid-electric data acquisition vessels for XOCEAN.

The 27-ft 100% solar powered boat Wayward Sun achieved a major milestone when it completed a historic

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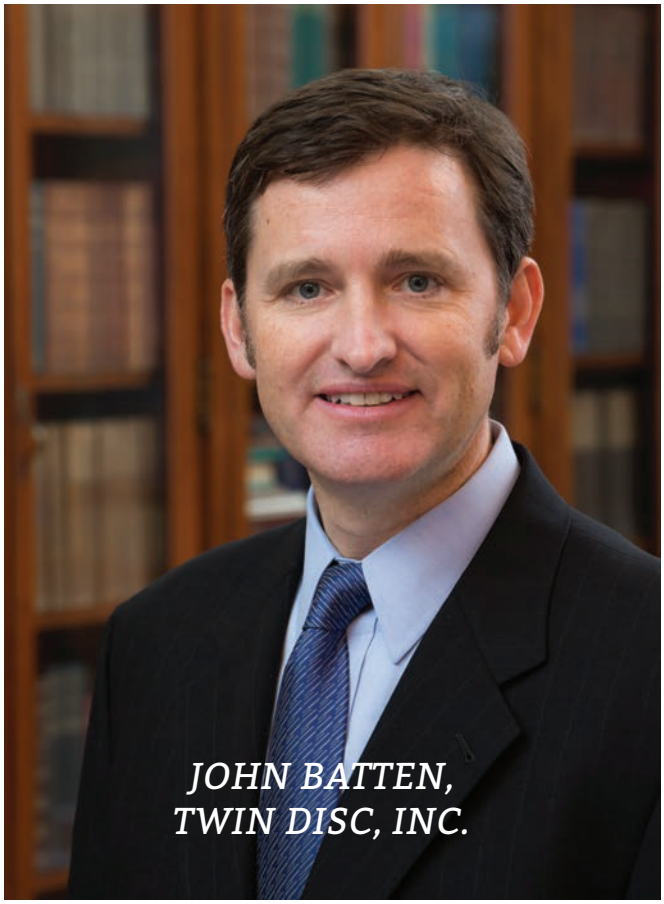


JOHN BATTEN, TWIN DISC, INC.

1,400-mile voyage from Washington State to Glacier Bay, Alaska, using a Torqeedo electric motor and batteries with no genset or shore charging.

Torqeedo and Poseidon collaborated this year to develop a new commercial-grade electric azimuth thruster meeting the clean air requirements for European inland waterways. The first project is an ES-TRIN certified solar-electric passenger ferry built by Ampereship in Germany.

Twin Disc, Inc.

Twin Disc, Inc. designs, manufactures and sells marine and heavy-duty off-highway power transmission equipment. Products offered include marine transmissions, azimuth drives, surface drives, propellers and boat management systems, as well as power-shift transmissions, hydraulic torque converters, power take-offs, industrial clutches and control systems. The company sells its products to customers primarily in the pleasure craft, commercial and military marine markets, as well as in the energy and natural resources, government and industrial markets. The company's worldwide sales to both domestic and foreign customers are transacted through a direct sales force and a distributor network.

The trend toward hybrid marine propulsion systems continues to accelerate, particularly in Europe, as suppliers and operators see increasing benefits: reduced emissions for regulatory compliance, and fuel and maintenance savings for faster return on investment. Clearly, Twin Disc sees significant opportunity in this trend. Its acquisition of Veth Propulsion includes Veth's industry-leading technology and an industry-wide reputation for innovation and reliability. With expanded engineering capabilities, Twin Disc is ready to meet growing demand for electric or electric and diesel-electric propulsion systems. Its flexible solutions include serial hybrid propulsion, or full electric, and parallel hybrid, toggling between electric and diesel power to turn the shaft. Projects are already in the works in North America, Europe, Asia and Australia, with more on the horizon—shaping the company's marine product line as well as the future.

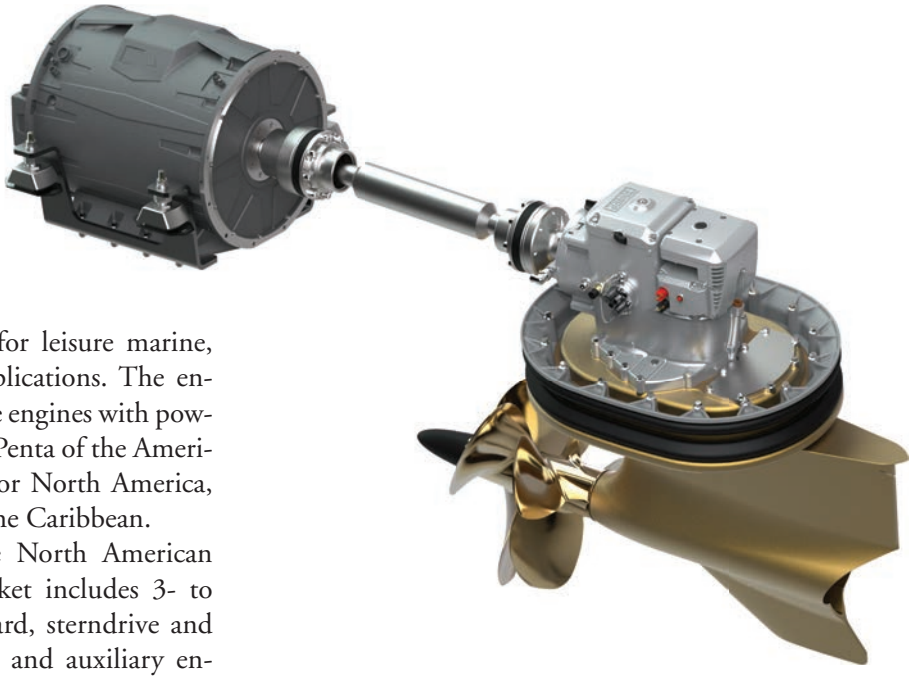
Twin Disc hybrid propulsion systems combine electric motors and diesel engines, enabling switching between the two or using both for a power boost. Electric operation, practical at low power and speed, cuts fuel use and emissions. Hybrid uses include vessels with long waits between jobs (tugboats, pilot boats); those regularly operating at slow speeds (patrol boats, survey vessels); and those whose low full-power requirements let them rely on less costly diesel plus power boosts.

Volvo Penta of the Americas

With a 114-year tradition of innovation, engineering excellence and worldwide customer support, Volvo Penta offers a broad product line of engines that reduce fuel consumption, lower emission levels, extend service life and maximize uptime. The company is also a technology leader in the movement toward sustainability in marine propulsion.

With approximately 3,500 dealers in over 130 coun-

VOLVO PENTA



tries, Volvo Penta, part of the Volvo Group, is a global manufacturer of engines and compete power systems for leisure marine, commercial marine and industrial applications. The engine range comprises diesel and gasoline engines with power outputs from 10 to 1,000 hp. Volvo Penta of the Americas, based in Virginia, is responsible for North America, South America, Central America and the Caribbean.

Volvo Penta's product line for the North American commercial and SOLAS marine market includes 3- to 16-liter Tier 3 diesel engines in inboard, sterndrive and IPS configurations, as well as gensets and auxiliary engines for fuel pumps and other applications. Key market segments for Volvo Penta globally include Coast Guard and patrol boats, pilot boats, short-sea and river transport, crew and supply vessels, research vessels, passenger ferries and sightseeing vessels, workboats, tugs and towboats, self-propelled and articulated barges, commercial fishing boats and wind farm vessels. Volvo Penta's marine diesel engines provide higher torque out of the hole, superior performance at all rpm ranges and the lowest costs of ownership with better fuel efficiency, longer service life and less downtime on the job.

Volvo Penta is also leading the way into a more sustainable future. Parent company Volvo Group has announced targets to reach net-zero value chain emissions by 2040 at the latest, and the pathway to reach the goals of the Paris Climate Agreement has now been validated by the Science Based Targets Initiative. Volvo Penta is developing action plans to secure the commitment in its business.

The company continues to invest in its core products to improve efficiency, reduce fuel consumption and minimize emissions. At the same time, Volvo Penta is boosting its investment in sustainable technologies with a strong focus on hybrid, electric and renewable fuels. Volvo Penta expanded its electromobility capabilities, experience and range by becoming the majority shareholder of Norwegian marine battery and electric driveline solutions supplier ZEM AS. And, in collaboration with Danfoss Editron, Volvo Penta is powering two hybrid windfarm support vessels using pilot technology. These vessels, which will soon go into operation in the UK, are an innovative combination of integrated electric Volvo Penta IPS, state-of-the-art gensets and advanced vessel management systems.

New engines and services for 2021 include a new D16 IMO Tier III /U.S. EPA Tier 3 package, updated D13 solutions, upgraded D8 and D13 engines to meet EU Stage V marine emissions for Inland Waterways and the Volvo Penta Inboard Performance System (IPS) and IMO III technology. The company will also soon bring to market a D8 IMO III for rating 1 and 2.

Notable commercial marine wins in North America this year have included new boats for the Virginia and Maryland pilot associations, including IPS and inboard configurations, and retrofits for a fleet of river tugs. Volvo Penta has also sold 3 D8MG IMO III engines for a passenger vessel in Canada. The company continues to pursue opportunities with builders and operators of crew boats for the burgeoning offshore wind turbines industry in North America based on a proven track record in global markets.

NAVAL ARCHITECTURE


BMT


BOKSA MARINE DESIGN

BMT

As one of the world's premier independent ship design and engineering firm, BMT offers the complete range of naval architecture and marine engineering services to shipbuilders, operators, and fleet owners. The firm's experienced U.S.-based ship design and engineering professionals support projects throughout the vessel life cycle, from requirements and concept development through class and production design, and post-delivery support. BMT offers high-value knowledge and expertise in a range of technical and program management disciplines, and is a leader and key partner in executing ship design, acquisition and other technical programs for both commercial and government customers. With a substantial footprint in the U.S. and locations such as the U.K., Australia, Canada and the far east, BMT offers global resources and expertise to deliver expert products and services. In the U.S., BMT employs professionals in all key ship design, engineering, maintenance and program management disciplines from offices in Virginia, Texas, Washington and at home offices and customer sites throughout the continent and Hawaii. Its global capability and U.S. workforce position BMT as the leading independent firm in the U.S. shipbuilding market.

BMT continues to develop its U.S.-based business, and position itself as a partner of choice for ship owners, shipbuilders, agencies, and companies requiring expert technical services in the maritime and government sectors. The past year has seen key successes in terms of new ship deliveries, key project wins, new business partnerships, and record company growth. BMT is actively executing multiple key projects in sectors such as U.S. offshore wind, passenger vessels, patrol craft, workboats and naval ships.

In the past year, Kitsap Transit has accepted delivery of two new high-speed passenger ferries designed by BMT and built by Nichols Bros. Boat Builders. The Enetai and Commander carry 255 passengers at speeds up to 38 knots. As the U.S. wind industry heats up, BMT is a key partner for the design of wind farm support vessels/crew transfer vessels (CTVs). The WindServe Odyssey is operating on the U.S. east coast and more are in the pipeline. BMT has also delivered projects and contract wins as an independent partner for shipbuilders executing U.S. government programs, including T-AGOS(X), T-ARC(X), LAW, OPC and others. BMT also partnered in the delivery of a new workboat for the State of Maryland that is currently under construction.

Boksa Marine Design

Boksa Marine Design (BMD) is a naval architecture and marine design firm located just outside of Tampa, in Lithia, Fla. Founded by naval architect and marine engineer, Nicholas Boksa, P.E., Boksa Marine Design's engineers have actually worked on ships at sea and have a wide array of expertise and practical experience building in steel, aluminum and composite. "Every Boksa boat is a rugged vessel with exceptional seakeeping capabilities. Since our naval architects and marine engineers are working sailors who kicked steel onboard, every design is engineered like a ship we'd actually take to sea," Boksa said.

Boksa boats are designed, engineered and built to exceed the operational requirements of their unique mission. The firm provides production engineering, systems engineering and complete refit engineering for the commercial marine industry, including workboat, inland river and shallow draft market. Among its notable recent projects, Boksa pro-

BRISTOL HARBOR GROUP, INC

ELLIOTT BAY DESIGN GROUP

vided complete design and engineering for new 78' push tug J. Arnold Witte at DonJon Shipyard. BMD completed refit engineering on harbor tugs for Van Enkevort tug and barge, with design and construction support on newly launched 740' x 78' self-unloading barge Michigan Trader. Tug Laura L. Van Enkevort is a 124' x 37' x 18' ATB tug with Bludworth connection; refit added accommodations and raised upper pilothouse for visibility, overhauling the engines and gears, new joinery work for the interior.

Bristol Harbor Group, Inc.

Bristol Harbor Group, Inc. is one of the leading naval architecture firms in the country. The full-service naval architecture, marine engineering and consulting firm is located on the harbor in Bristol, R.I., where the company has been in business for more than 25 years, having produced numerous designs, to which hundreds of vessels have been built. BHGI specializes in commercial vessel design and consulting and have experience with tugs, barges, ATBs, passenger vessels, workboats, dredges and floating dry docks.

BHGI utilizes state of the art computer modeling and design tools. Some of the naval architecture services provided include structural analysis, finite element analysis, deadweight surveys, hydrodynamic analyses utilizing computational fluid dynamics and hydrostatic analysis. BHGI also offers a range of marine engineering services. Its engineers focus on the design of new vessels, repowerings, and mechanical and electrical upgrades to existing vessels, as well as crane specification and integration, piping design, fuel system design, main engine specification and electrical load analysis. In addition to designing vessels, BHGI provides technical support and consulting services to vessel owners, charterers, and operators. These services can be in support of a new construction project, modifications, regularly scheduled dry docks or more comprehensive maintenance periods. BHGI offers a full spectrum of services from concept design through shipyard selection and construction oversight. This can include detail design, implementation of tests and trials, and eventual lifecycle management and maintenance support.

The firm is currently working on exciting projects involving advanced fuels, advanced hull forms and hybrid-diesel-electric propulsion. BHGI designed Holland, a 400- by 100-foot ocean transport barge built for General Dynamics Electric Boat to support the construction and maintenance of the Columbia Class ballistic missile submarines and Virginia Class fast attack submarines. BHGI recently completed the design of a new floating dry dock for the USACE Ensley Engineer Yard, which will replace the 400-ton drydock 1015 at the Ensley Engineer Yard. BHGI also completed the contract design for the DRIFTMASTER II for USACE, a catamaran hull that incorporates a diesel electric hybrid propulsion system. BHGI is working on other projects such as a high-speed foil assisted catamaran, multiple deck, crane, and liquid cargo barges, and multiple projects for the defense industry.

Elliott Bay Design Group

Elliott Bay Design Group is a full-service, employee-owned naval architecture and marine engineering firm, considered a national leader in innovative vessel design.

MORGAN FANBERG, GLOSTEN

MICHAEL S. FITZPATRICK, ROBERT ALLAN LTD.

The Seattle-based team of naval architects, engineers, designers and analysts offer extensive engineering and production support for the marine industry. EBDG's design and engineering capabilities are complemented by extensive analytical services, hands-on experience in vessel operation, and thorough working knowledge of shipyard construction practices. EBDG's team of designers and engineers utilize the latest, state-of-the-art analysis tools such as finite element analysis (FEA) and computational fluid dynamics (CFD) to help customers resolve difficult problems. The group has also fully leveraged 3D scanning to support services like hull scanning, interior layout, and piping systems modifications.

The company is actively involved in multiple eco-friendly vessel designs and hybrid feasibility studies, and its designs incorporate all forms of fuel-efficient hybrid power and alternative propulsion options. By providing owners, operators and shipyards across the country naval architecture, marine engineering and production support services that result in the design and construction of cleaner ships, EBDG aims to help make a greener maritime future a reality. For example, EBDG is involved in the conversion of the Jumbo Mark II ferries to hybrid technology for Washington State Ferries, and it was awarded to design a new diesel-electric pax/vehicle ferry for Texas DOT. EBDG is also designing a 164' double-ended pax/vehicle ferry for Casco Bay Lines that will target energy optimization with a desire to run all-electric under most circumstances, as well as a 184' double-ended pax/vehicle ferry for Whatcom County that will operate as a diesel mechanical / battery hybrid.

Glosten

Glosten has served the marine industry for over 60 years, offering naval architecture and marine engineering services throughout the U.S. and abroad. Since its founding in 1958, the full-service naval architecture and marine engineering firm has set out to "do more than design", with engineering capabilities that extend to a variety of vessels and marine structures, including research vessels, ferries, tugs, barges, floating bridges, offshore installations, and special-purpose platforms.

As an employee-owned firm with offices in Seattle, Wash. and Providence, R.I., Glosten continually seeks out projects that excite and challenge its team. Glosten's staff represent a wide variety of engineering disciplines, and many of their team members are licensed professional engineers with hands-on shipyard or seagoing experience. The firm specializes in vessel design and modification, marine operations and logistics, marine offshore structures, vessel procurement consulting, technology development, and marine infrastructure. Glosten welcomes complex, unique projects that demand creative solutions, and has cultivated a portfolio that spans every sector of the industry.

As new technologies emerge, Glosten finds ways to harness their capabilities in order to enhance their work. Not only do they use state-of-the-art 3D design software, they were the first naval architecture firm to utilize laser scanning to support retrofits and construction projects. In addition, Glosten has their own VR and AR equipment and are developing in-house tools that will usher in a new era of design.

Glosten has been at the forefront of the decarbonization movement in the U.S., paving the way for hybrid, all-electric, and alternative energy propulsion systems. Glosten's work on the hybridization of the Jumbo Mark II class of vessels in the Washington State Ferries (WSF) fleet is currently underway. The firm was hired by Siemens Energy to provide the preliminary and contract design integration of the propulsion controls and hybrid system. The first ferry in line for conversion is expected to enter the shipyard this year. The vessel will be able to rely on battery-electric power for the duration of its route, enabling zero-emissions operation. Once the hybridization of the Jumbo Mark II class is complete, they will be among the largest and most powerful battery-hybrid vessels in the U.S.

Robert Allan Ltd.

Robert Allan Ltd. is Canada's most senior consulting naval architecture and marine engineering firm, first established in Vancouver, B.C. in 1930, with an international reputation for innovative designs of a wide range of vessels for service in the marine transportation industry. In particular, it has earned a reputation as a leader in harbor and seagoing tugs, shallow draft towing vessels and fireboats for major world ports.

Robert Allan Ltd. has extensive in-house computational fluid dynamics (CFD) expertise in performing detailed hydrodynamic performance simulations utilizing a powerful and continually upgraded high performance computer cluster. This capability enables the firm to deliver quick and accurate solutions at a lower cost than model tanks or external consultants. This in-house capability also allows for highly efficient design optimization.

Earlier this year, Robert Allan Ltd. introduced a trio of battery-electric, zero-emissions 70 t BP ElectRA 2800 harbor tugs for HaiSea Marine's tug fleet. With clean hydroelectric power available from the local grid, these tugs' generous battery capacity of up to 6,102 kWh will allow

them to perform a majority or perhaps even all missions on battery power alone, demonstrating the exciting potential of leveraging battery technology to realize near complete elimination of CO2 and other potentially harmful exhaust emissions from harbor tug operations.

In addition, a new fleet of innovative diesel/battery electric pushboats for Hidrovias do Brasil S.A. have recently begun construction in Belov Engenharia Shipyard, in Salvador, Brazil, to a RAL RApide 2000-E design. The vessels—expected to be the world's first battery electric shallow draft pushboats—will provide terminal assistance on the Amazon River system, with delivery of the first vessel in 2022.

The Shearer Group, Inc.

A premier naval architecture firm with focus on the inland marine industry, The Shearer Group, Inc. (TSGI) has led the industry with several significant z-drive towboat designs, diesel electric with energy storage ferry designs, dredges, dump scows, and innovative projects like liquefied natural gas (LNG) fueled vessels. TSGI naval architects are intimately familiar with the current ABS rules and U. S. Coast Guard regulations for barges and towboats, and the company utilizes state of the art computer modeling and design tools in concert with time honored design practices to develop innovative and functional designs.

TSGI's marine engineering practice focuses on the design of new vessels, but its engineers also work on repowers, vapor control systems, and mechanical and electrical upgrades. TSGI also offers marine surveying and construction oversight services. These services can be in support of new construction projects, modifications, regularly scheduled dry dockings or more comprehensive maintenance periods.

The firm specializes in inland workboats, including ferries, towboats, dredges, drydocks, marine construction equipment, dump scows and tank barges. After providing a new design for Texas Department of Transportation for a new 495 passenger, 70 car diesel-electric with energy storage ferry, TSGI has been subsequently tasked to provide construction oversight and project management services for TXDOT for this ferry. TSGI was contracted by National Maintenance & Repair to design the 70-foot towboat, Dwain Harper, which featured a retractable pilothouse. TSGI was also contracted by Superior Marine to design the motor vessel Tri-State, which was delivered to Marathon Petroleum. Other projects include a set of four caustic soda barges, designs for two drydocks, service life extension projects for three dredges, and feasibility studies for conversions of a line haul towboat to LNG as a fuel.

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SHIPBUILDING & REPAIR

ALL AMERICAN MARINE

CONRAD SHIPYARD

All American Marine

All American Marine got its start more than 30 years ago specializing in the construction of aluminum fishing vessels used from California to Alaska. But the Pacific Northwest boatbuilder adapted to changing markets in the '90s, and today it is a builder of custom-tailored aluminum high-speed passenger boats, hybrid vessels, dinner cruise boats, patrol and research vessels. In 2017, AAM relocated to a new state-of-the-art facility in Bellingham, Wash., where all of its vessels are built in a 57,000 sq. ft. production facility adjacent to Bellingham Bay. The production shop contains seven overhead bridge cranes, a brake press, shear, CNC router cutter and a laser-leveled construction platform.

AAM has exclusive North American building rights with one of the world's top naval architects and designers, Nic de Waal of Teknicraft Design, in Auckland, New Zealand. The unique Teknicraft design incorporates the use of a cutting-edge hull shape and an optional hydrofoil system in catamarans to create lift and enhance vessel performance. Unique design characteristics ensure high-speed travel, ultra-low wake, industry-leading fuel efficiency, and all fully customizable depending on the application.

All American Marine recently launched Sea Change, a 70-foot, 75-passenger zero-emissions, hydrogen fuel cell-powered ferry that will operate in the California Bay Area. This will be the first hydrogen fuel cell vessel in the U.S., representing a monumental step in the U.S. maritime industry's transition to a sustainable future. The ferry was developed to demonstrate a pathway to commercialization for zero-emission hydrogen fuel cell marine technologies. The completed ferry will exhibit the viability of this zero-carbon ship propulsion technology for the commercial and regulatory communities.

Conrad Shipyard

Conrad Industries, Inc., established in 1948 and headquartered in Morgan City, La., designs, builds and overhauls tugboats, ferries, liftboats, barges, offshore supply vessels and other steel and aluminum products for both the commercial and government markets. The company provides both repair and new construction services at its five modern and expansive shipyards located in southern Louisiana and Texas.

With an experienced workforce and computerized manufacturing equipment; multi-disciplined engineers; and a management team focused on customer satisfaction, Conrad Shipyard is well positioned to provide cost-effective solutions to complex shipbuilding challenges. The company's portfolio includes a wide range of vessels built for commercial customers and for the U.S. government, having delivered more than 1,100 vessels and fabrication products to date.

GLADDING-HEARN SHIPBUILDING

Earlier this year, Conrad commenced construction of a new 6,500- cubic-yard-capacity trailing suction hopper dredge for Great Lakes Dredge and Dock. Scheduled for delivery in 2023, the dredge will feature two 800mm suction pipes and will be able to dredge at depths of up to 100 feet. The vessel has principal dimensions of approximately 346 feet in length, 69 feet in breadth and 23 feet in depth, and total installed horsepower of 16,500.

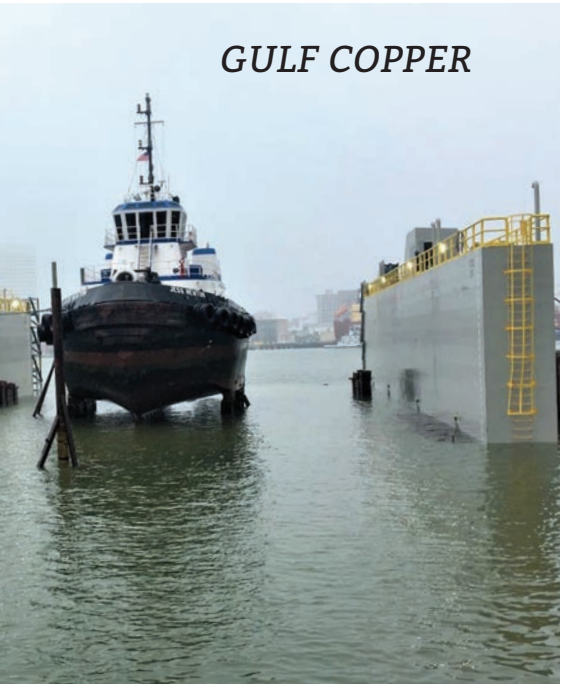
Detyens Shipyards, Inc.

Detyens Shipyards, Inc., located in Charleston, S.C. is a one of the largest commercial shipyards on the U.S. East Coast, well positioned to service both blue and brown water fleets. Detyens provides emergency and scheduled maintenance and repair work for both domestic and international operators, including government and commercial vessels. The yard's location in the deepwater Port of Charleston offers deep draft repair berths, graving and floating dry docks along with all the services one would find at any modern ship repair facility. The Detyens Shipyards facility offers three graving docks and with a capacity of up to Panamax. In addition to the docks, the facility also offers modern, enclosed shops for all crafts; eight 56-ton gantry cranes (on a continuous rail system); four tower cranes; rail access and over 8,000 ft of deepwater pier space and a floating dry dock for smaller vessels.

Of course, the facility is only part of the equation. Family owned and operated since its inception, the company has continually emphasized customer service, family values and safety in the workplace. Hard work, dedication and the goal to provide economical ship repair services is the benchmark behind the Detyens Shipyards creed, "Customer before Company, Employee before Owner, Family before Self, and Safety Above All."

Gladding-Hearn Shipbuilding, Duclos Corporation

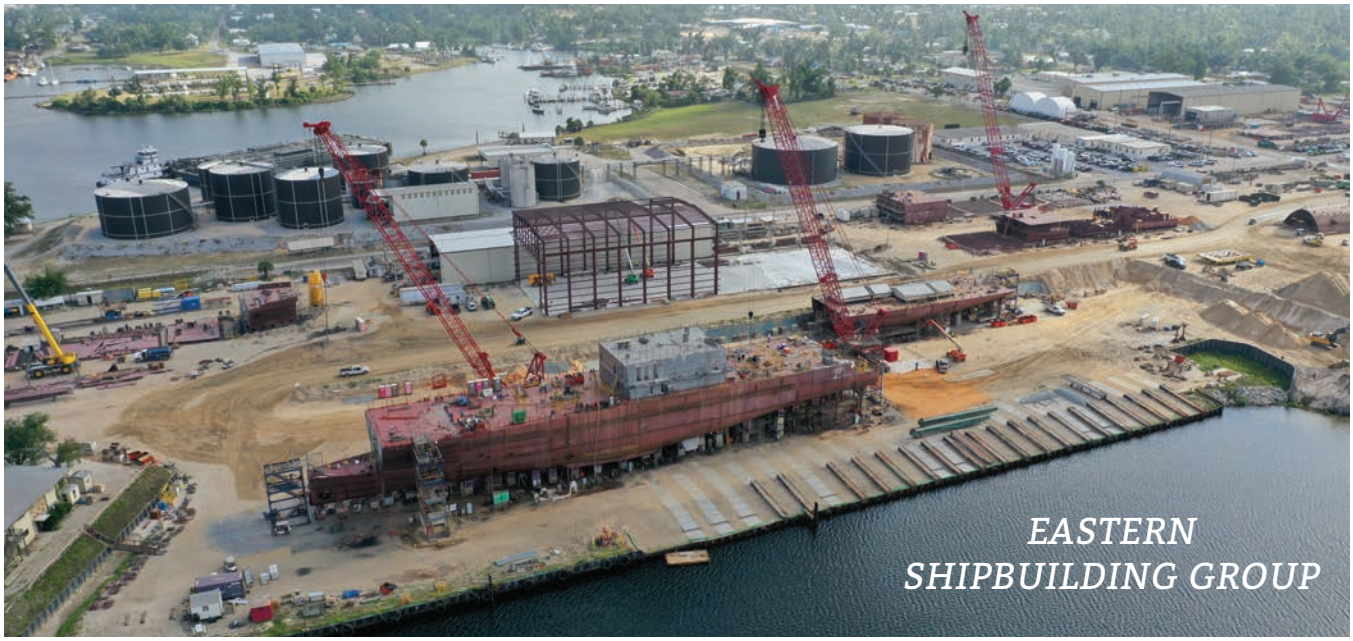
For almost 65 years, Gladding-Hearn Shipbuilding has built steel and aluminum commercial vessels operating in the U.S. and foreign countries. Located on seven acres



along the deepwater Taunton River in Somerset, Mass., the family-owned and operated shipyard is currently under the leadership of co-presidents Peter Duclos and John Duclos. Nearly all of the several hundred vessels built by the shipyard are still operating today, and some 90% of Gladding-Hearn's business is from repeat customers.

With in-house naval architecture and engineering capabilities and a cross-trained workforce, Gladding-Hearn is well-known for applying some of the most advanced shipbuilding techniques that rival many bigger yards, while still providing the personal customer service of a smaller yard.

The builder's primary products include pilot boats, high-speed passenger catamarans and mono-hull ferries, tugs, patrol and rescue boats, crew transfer vessels and research vessels. Since 1955, Gladding-Hearn has been



synonymous with pilot boats, having built more launches than any other shipyard. In 1978, the yard joined forces with designer C. Raymond Hunt to build the first launch with a deep-V hull, soon to become the industry standard. In 2014, the shipyard built the first pilot boat application of Volvo Penta's IPS drives in the United States. Having built over 200 tugs, barges and bridge tenders, the shipyard delivered America's first Z-drive tractor tug in 1977. An Incat Crowther licensee since 1987, Gladding-Hearn became the second shipyard in the country to build high-speed passenger catamarans and has built the majority of fast ferries on the East Coast and Great Lakes.

Gulf Copper and Manufacturing

Gulf Copper & Manufacturing Corporation is an employee-owned company that repairs and refurbishes marine vessels and offshore rigs, and fabricates ancillary components, with shipyards, dry docks, machine shops and fabrication along the U.S. Gulf Coast.

The company has supported the local communities in the Port Arthur, Texas area for over 70 years, brining vital commercial growth to the community and supporting local charities year on year. In Galveston, Gulf Cooper has expanded the economic growth since taking over the Todd Shipyard in 1996, at times employing more than 1,200 personnel through shipyard projects and working with Texas A&M for many through sponsorships and intern programs. Over the last 20 years, the Hale family, led by Steve Hale, has supported the Gulf Copper family with a steady hand, bring prosperity to every individual and the community alike.

In addition to the federal government, Gulf Copper serves the oil and gas, marine transportation, refining, and petrochemical markets, operating strategically located shipyards, drydocks and fabrication facilities along the Gulf Coast. More recently, the company has been supporting offshore wind in Virginia. Among recent notable projects, Gulf Copper performed maintenance and refurbishment of the USNS Comfort (T-AH-20), a Mercy-class U.S. Navy hospital ship.

Eastern Shipbuilding Group

Headquartered in Bay County, Fla., Eastern Shipbuilding Group has built a portfolio of more than 350 vessels

FINCANTIERI BAY SHIPBUILDING

for national defense and commercial purposes over the span of more than 40 years. Today, the company manages complex government shipbuilding projects as well as commercial projects from three state of the art facilities for new construction and repair projects on the Florida Gulf Coast.

Eastern recently built the latest fleet of iconic Staten Island Ferries and serves as the prime contractor for the U.S. Coast Guard's highest acquisition priority, the Heritage Class Offshore Patrol Cutter program. To date, Eastern has earned the award of construction for OPCs 1 through 3 and the LLTM contracts for OPCs 1-4. The USCG plans to award construction of the fourth cutter in spring of 2022, and Eastern is competing for Stage II of the program to build ships 5-15 over the next 15 years. The shipbuilder also serves the commercial dredge and offshore wind markets, having recently been awarded a second hopper dredge build from Weeks Marine.

Easter has just completed a $6 million infrastructure improvement project at its new 40-acre Port St. Joe facility to allow for vessel outfitting to commence. The company has embarked on a $50 million, 15,000 ton drydock project at this facility in order to provide full vessel sustainment services.

SHIPBUILDING & REPAIR

MOOSE BOATS

RIBCRAFT

Fincantieri Bay Shipbuilding

Fincantieri Bay Shipbuilding traces its rich history of delivering quality ships to the year 1918. The shipyard is an operating unit of Fincantieri Marine Group, the United States division of global shipbuilding giant Fincantieri, employing 20,000 shipbuilding professionals in 18 shipyards and with a history of delivering more than 7,000 ships.

Fincantieri Bay Shipbuilding's portfolio reveals the diversity of products delivered—from articulated tug-barge units to fishing vessels to dredges to offshore supply vessels to ferries to specialty barges—the yard is experienced in construction of complex vessels of every variety. The shipyard is currently building a 5,400 cubic meter bunker barge for bunkering the LNG fueled cruise ships currently being built in Europe that will offer cruises from Florida to the Caribbean—a first step in a strategy to create a complete platform of LNG transport solutions for U.S. customers. In 2022 FBS will deliver the Mark Barker, the first U.S-flagged Self-Unloading bunker for Great Lakes service built since the early 1980s. The shipyard is skilled in the time-sensitive repair and conversion of the Great Lakes bulk carrier fleet, and its record for on-time delivery is unmatched. Fincantieri Bay Shipbuilding has multi-disciplined in-house engineers and a wide portfolio of proven, time-tested designs to meet the critical needs of its customers.

FBS is currently investing in significant yard footprint expansion, including two climate-controlled manufacturing buildings, to prepare for the serial component construction of the U.S. Navy Constellation Class Guided Missile Frigate, of which sister company Fincantieri Marinette Marine is the prime.

Moose Boats

Vessels built by Moose Boats are considered to be among the finest aluminum military, law enforcement and firefighting vessels in the industry. As a semi-custom vessel builder, Moose Boats builds aluminum catamarans and monohulls designed to meet a variety of mission specific applications for law enforcement, emergency response, and security patrol purposes; the Vallejo, Calif. boatbuilder's clientele includes U.S. Navy and several high-profile law enforcement and firefighting agencies throughout the country.

Notable recent builds include a M2 – 38-foot water jet catamaran fireboat for Rochester, N.Y. Fire Department and a 75-foot catamaran built for WestStar Marine to be used as a crew transfer vessel (CTV).

RIBCRAFT

Marblehead, Mass. based RIBCRAFT is the only boat builder specializing exclusively in building professional grade rigid inflatable boats (RIBs). Serving all commercial markets; from military agencies and state and local governments to safety professionals, private industry and non-profits, RIBCRAFT vessels are available from 15 feet to 41 feet, and built to order in the United States.

RIBCRAFT has delivered thousands, specializing in building mission specific patrol and rescue boats, tactical and special operations, support and workboat vessels, dive boats, and USCG Certified passenger for hire vessels. RIBCRAFT designs and builds RIBs to meet the emergent requirements of military and government agencies with current contracts with the U.S. Navy and California Department of Fish & Wildlife. RIBCRAFT remains dedicated to building rescue and patrol boats for First Responders with recent deliveries and awards for departments all over the country.

Silver Ships

Founded in 1985, Silver Ships is a family-owned premier builder of high-quality, cutting-edge aluminum workboats from 21 feet to 70 feet in length, used for fire rescue, law enforcement, military operations, marine surveying and other mission-specific applications. Its vessels are based on existing design types but are uniquely customized and outfitted for the needs of individual customers in the U.S. and overseas. An on-site accredited naval architects and engineering staff designs all boats within a three-dimensional modeling and hydrodynamic design software to ensure safety and operational usage in design, development, design evaluation and calculation throughout all stages of construction. From the initial design to the final send-off, every step of the boat building process is completed at Silver Ships' headquarters in Theodore, Ala. It also offers boat repairs and comprehensive refurbishment services for all makes and models of aluminum workboats.

Silver Ships was the first builder to manufacture RHIBs in the United States 30 years ago. Silver Ships' most popular and versatile vessel is the Ambar series, part of the RHIB family – its original "hybrid" air-and-foam collar provides excellent stability, making the vessels virtually unsinkable.

In the past couple of years, Silver Ships has updated its product line to include the Freedom series of vessels, designed for law enforcement and fire rescue missions. In 2020 the company also launched a new business within its umbrella, Gulf Coast Suzuki, to serve local recreational and commercial boaters in need of repairs or maintenance on their Suzuki engines.

United States Marine, Inc.

Headquartered in Gulfport, Miss., with a maintenance/repair facility in Chesapeake, Va., United States Marine Inc. is a fully integrated manufacturer of military, patrol and special warfare boats available in lengths from 21 feet to 90 feet. The company is capable of designing, building, and testing

all of its vessels in house. USMI has been delivering to U.S. Department of Defense and government/military customers from more than three decades with a track record that speaks for itself. "Quality is defined by the customer, and in the DoD world that is defined by a specification, scope of work and CDRLs [contract data requirements list]," says Barry Dreyfus Jr., CEO. "Our documented history of zero defects at the start and end of acceptance trials gives the government assurance we can deliver upon our obligations."

The shipbuilder, whose main Gulfport facility has a certified ISO 9001:2015 Quality Management System for the Design and Fabrication of Watercraft for Military Applications, recently secured a $108 million, five-year, indefinite-delivery, indefinite-quantity contact to build Combatant Craft Assault vessels to support U.S. Special Operations Command missions globally. The CCA is also the fourth USMI-designed craft to be awarded the David Packard Excellence in Acquisition Award (including two from USSOCOM) over the last 25 years, Dreyfus says. The award recognizes organizations, groups and teams that have demonstrated exemplary innovation using best acquisition practices that achieve acquisition excellence in DoD.

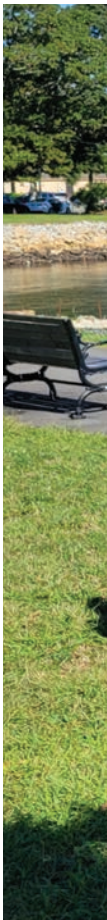
In addition, USMMI's Naval Special Warfare Rigid Inflatable Boat, in production since 1998, continues to be a go-to craft for special forces around the world. The builder reports a significant backlog for the NSWRIB for the coming years.

Maritime Academies Work Toward Inclusion

BY TOM EWING

Kristjan Petersson / U.S. Embassy Reykjavik

U.S. Coast Guard Academy cadets aboard USCGC Eagle (WIX 327), "America's Tall Ship," during summer 2021.



U.S. Coast Guard officer candidates train aboard the Coast Guard Cutter Eagle in Spring 2020.

David Weydert / U.S. Coast Guard

Massachusetts Maritime Academy

Last May, the U.S. Coast Guard Academy (CGA) announced that 240 new officers made up its 140th graduating class.

The Academy's announcement referenced additional, important highlights. Women made up 34% of the Class of 2021, and 34% of the graduates were from underrepresented minority groups. Even more focused was the statement that 22 African Americans "walked the stage," the largest number in Academy history, and 2021 included the second highest number of Asian American and Pacific Islanders.

To make the ceremony even more memorable, President Biden delivered the keynote address. Indeed, in his remarks, the President noted and commended the Academy's diverse student mix. He told the cadets, "You're joining the service that not only serves as America's front line, it increasingly looks like America."

The ideal that American institutions should proportionately reflect America's racial and ethnic diversity is not new, but President Biden's directives have surely recharged that goal.

This article takes a closer look at minority student recruitment and graduation at the Coast Guard Academy and the state maritime academies. All of the state academies were contacted – as well as the U.S. Merchant Marine Academy, in Kings Point, N.Y. – but not all responded.

This report seeks to present a big-picture look within university-level maritime education, particularly among Black students, so specifically referenced within the CG's graduation announcement. We asked colleges: How have recent recruitment efforts changed? Are future classes trending to reflect America's mosaic of people and races?

Importantly, state school systems will largely reflect the demographics of the state. Black Americans, for example, make up 13.4% of the U.S. population (2019 U.S. Census estimates). State and regional statistics, however, vary. In Maine, for example, Black people make up 1.7%—about 22,000 individuals— of the state's population of 1.34 million. With diversity and inclusion, numbers are not the whole story, but still critical for a big picture.

The U.S. Coast Guard Academy

Capt. Michael Fredie is the CGA's Director of Admissions. Fredie said that 11 years ago the Academy's "underrepresented minority population" was 11%. "Now we're at 36%," he said.

CGA minority statistics reference four sub-groups: Asian, Black or African-American, Hispanic and a more general group of students with varied racial backgrounds.

The Academy currently has 1,072 students among all classes, Fredie said. Sub-groups are as follows:

CGA Minority Students, fall 2021, out of 1072 students.	# of students
Asian	79
Black	43
Hispanic	124
Mixed-race	115
Total	361 (34%)

Fredie said the aggregate number of minority students increased because of deliberate and consistent outreach. Admissions and recruitment staff have vastly improved their ability to reach underserved populations. Electronic messaging, in-person meetings and social media are vital. Additional support comes from volunteers known as the Academy Minority Outreach Team, a group of active duty minority officers, mostly CGA graduates, serving in operational specialties. The AMOT team draws upon personal examples and experiences to help recruit prospective cadets and the team works as mentors for current cadets.

Fredie, who graduated from the Academy in 1996, was similarly influenced by the presence of Black officers. "My story is not much different from most. So, I can confidently say it's a big influence when you see somebody who looks like you doing the mission and carrying out the job; it's influential and helps you better understand a level of belonging."

For CGA, recruitment starts with freshmen and sophomores. "That plants a seed," Fredie said, keeping the Academy in a student's mind and allowing enough preparatory time to qualify for admission. The CGA admits 250-290 students/year, in contrast to around 1,500 cadets at the other U.S. military academies. In addition, CGA's academic program is limited to nine majors, from STEM and engineering to business and government. These factors result in a relatively small candidate pool and proportionally fewer minority applicants.

On retention, Fredie referenced the current new class of 285 students—40% women and 37% underrepresented minorities—as an example. Just six students left after the intense "Swab Summer" session. "That's the smallest number ever to drop out during the initial Academy indoctri-

Capt. Michael Fredie is the CGA's Director of Admissions. Fredie said that 11 years ago the Academy's "under-represented minority population" was 11%. "Now we're at 36%," he said.

CAPT. MICHAEL FREDIE

nation period," Fredie said.

"Every single student that's been appointed has been seen as being capable of making it academically, militarily and physically," Fredie emphasized. "It hurts when that doesn't happen, but our goal is to provide as much support as possible to get every single student to graduate. We need them in the fleet!"

Fredie noted that discussions about recruitment and race must be kept in larger context. "Diversity is a critical element in ensuring we are properly prepared to effectively carry out the Coast Guard's missions." Nevertheless, a student must demonstrate academic readiness and leadership potential. If not, "then we're not able to make an appointment," Fredie said.

California State University Maritime Academy

Cal Maritime is in Vallejo, on the northern end of San Francisco Bay, the only one of the U.S. maritime academies on the West Coast. This year Cal Maritime has 907 students, a bit lower than the average, around 1,000. The school offers a range of undergraduate degrees, from business administration to engineering to oceanography; it offers a master's degree in transportation and engineering.

In 2020-2021, for summer, fall and spring, Cal Maritime awarded 138 undergraduate degrees. (See summary table below.) Women made up 17% of undergraduates. Most students come from California.

2020-2021 Cal Maritime graduates, all majors, total = 138:

White	54
Black	2
American Indian	1
Asian	15
Pacific Islands	3
Two-or-more races	22
Hispanic	32
Unknown	9

This class, for all groups of students, was small due to COVID; in three of the four prior years, for example, there were five Black graduates.

In the fall of 2020, there were 21 Black students (2.3% of the total student body) among all classes.

However, the total number of "Under-Represented Minority" (URM) students was much higher: 343 (38%). Retention rates are similar for all Cal Maritime students meaning minority graduation is trending upwards, although slowly. For 2022 to 2024 the school expects 40 URM graduates each year. If Black students comprised 2.3% of that total (120) that means between 2-3 Black graduates each year.

Maria L. Martinez, PhD is Associate VP for Enrollment Management at Cal Maritime. She was asked to summarize the school's recruitment efforts, eventually to reach a student body that reflects overall racial and ethnic demographics.

Martinez said that California state universities, including Cal Maritime, use a systemwide initiative focused on URM students. COVID interrupted the use of SAT and ACT test scores. Cal Maritime, along with the other 22 state universities, adopted a "Multi-Factor Admission Supplemental Criteria." This expands the review of students with GPAs below established thresholds, looking closely at participation "in educational programs heavily participated (in) by racially diverse students and students from various socio-economic backgrounds," Dr. Martinez said. She added that this review "allows Cal Maritime to consider the potential for success of students in an environment that emphasizes hands-on learning and the development of leadership skills for maritime-related careers."

COVID-19 made virtual campus visits more common. In some ways, virtual admissions marketing "levels the playing field," Martinez commented, because it gives under-represented applicants the ability to "visit" and learn about Cal Maritime.

Massachusetts Maritime Academy (MMA)

Massachusetts Maritime Academy (MMA) is in Buzzards Bay. Student enrollment is 1,451 for 2022-2025. (See chart for a more complete breakout.) In 2020, 13% of students were female.

Michael Ortiz M.Ed. is Dean of Enrollment Management, Equity & Inclusion and Chief Diversity Officer at Mass Maritime. Ortiz leads a new division established in June 2021 by MMA president Rear Admiral Francis X. McDonald.

Projected Graduates by Race/Ethnicity by Class Year

		Class Year				
		2021	2022	2023	2024	2025
The race and/or ethnicity of the student (federal format)	Non-resident Alien	7	1	0	3	1
	Black or African American	4	6	2	3	6
	American Indian or Alaska Native	1	0	2	3	0
	Hispanic or Latino (of any race)	10	10	21	14	17
	White	322	336	275	255	319
	Race and Ethnicity Unknown	5	14	42	34	21
	Two or more races	11	12	11	14	12
	Asian	8	7	3	2	5
	Native Hawaiian or Other Pacific Islander	0	0	0	0	0
	Total	368	386	356	328	381

Note: in keeping with federal reporting conventions, graduating classes are based on a July 1st to June 30th time period (i.e., the Class of 2021 reflects projected degrees earned between 7/1/2020 and 6/30/2021). Class of 2021 figures are also considered provisional until reported to the state and federal government in October.

MMA Office of Institutional Effectiveness 9/2/2021

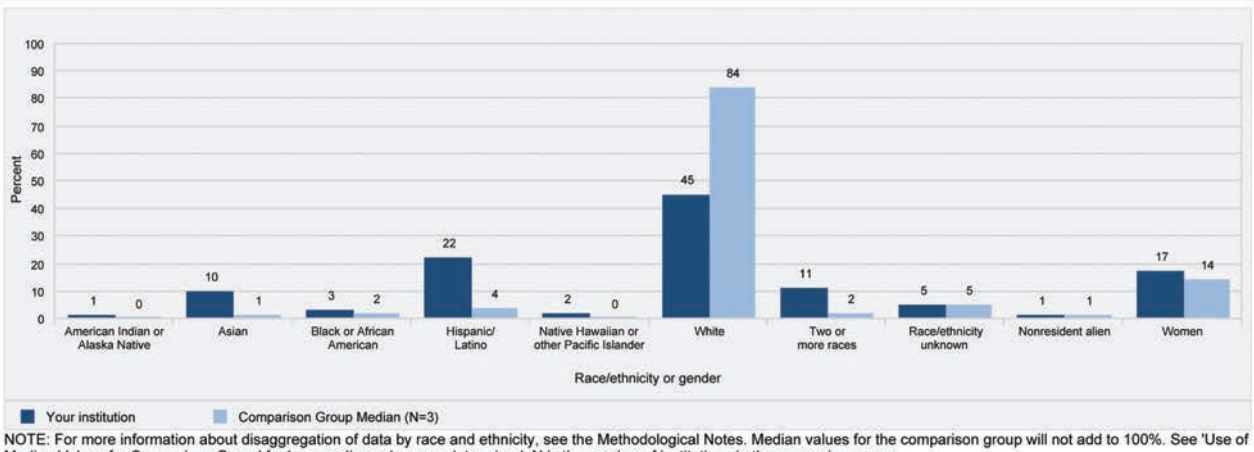
Massachusetts Maritime Academy

COVID-19 has made virtual campus visits more common. In some ways, virtual admissions marketing "levels the playing field" because it gives under-represented applicants the ability to "visit" and learn about the school, said Maria L. Martinez, PhD, Associate VP for Enrollment Management at Cal Maritime.

MARIA L. MARTINEZ, PHD

California State University Maritime Academy

Figure 1. Percent of all undergraduate students enrolled, by race/ethnicity, and percent of students who are women: Fall 2019



NOTE: For more information about disaggregation of data by race and ethnicity, see the Methodological Notes. Median values for the comparison group will not add to 100%. See 'Use of Median Values for Comparison Group' for how median values are determined. N is the number of institutions in the comparison group.

SOURCE: U.S. Department of Education, National Center for Education Statistics, Integrated Postsecondary Education Data System (IPEDS): Spring 2020, Fall Enrollment component.

California State Maritime Academy

"...we hope to be able to show interested students from all backgrounds how our special brand of hands-on education can be so rewarding."

– JANET ACKER, CHIEF OF STAFF AND EXECUTIVE ASSISTANT TO THE PRESIDENT OF MAINE MARITIME ACADEMY

Ortiz said that Mass Maritime has worked to gain a close understanding of the emerging generation of high schoolers. He said that "equality, inclusivity, stability and opportunities" are valued by students today and "therefore we have changed our initiatives and messaging to promote social mobility."

Mass Maritime adopted the American Association of Colleges and University Inclusive Excellence framework which helps colleges and universities integrate diversity, equity, and educational quality efforts into their missions and institutional operations.

As a state university, most of Mass Maritime's enrollment comes from Massachusetts, Ortiz said. Overall, the state's high school population is declining; however, the percentage of Black and Latinx students is rising. "Our strategy," Ortiz explained, is to "promote access and opportunity particularly in the twenty-six Massachusetts Gateway cities;" those are mid-sized cities such as Barnstable and Lowell and Springfield, urban centers at the core of larger economic regions.

Outreach programs are important and include leadership training, college admissions workshops and campus visits. Recently, for example, 12-to 16-year-old inner-city students spent a day on campus participating in team building activities, knot-tying, experiencing the ship simulator, and hearing from cadets. "The goal," Ortiz explained, "is to have fun, learn, and increase awareness of opportunities at Mass Maritime."

Black students complete MMA's four-year program at a rate close to all other students (approximately 80% retention vs 85%, respectively).

Maine Maritime Academy

Maine Maritime is in Castine, about 85 miles north of Portland. Maine Maritime has close to 900 students, about 17% are women.

Total student enrollment 2020:

White	737
Hispanic	38
Black	14
Asian	14
International	5
Unknown	83

Janet Acker is Chief of Staff and Executive Assistant to the President of Maine Maritime Academy. She explained that Maine Maritime is focused on encouraging young women to pursue maritime careers. Additional recruitment efforts focus on Maine's Native American Tribes, and, nationally, Black students from across the country.

COVID changed recruitment practices. "We look to place ourselves where the students go: that's online", Acker said. Online access in rural areas is a challenge, Acker noted. Some students depend on school Wi-Fi; some just have a cell phone. "We have to be friendly and accessible on all platforms," Acker said. Even with an online presence, campus visits are especially important. Acker noted that, "we hope to be able to show interested students from all backgrounds how our special brand of hands-on education can be so rewarding."

Maine Maritime currently does not require test scores. Many students are first-generation college students who have had challenging experiences during high school, particularly with balancing work and school and preparing for college.

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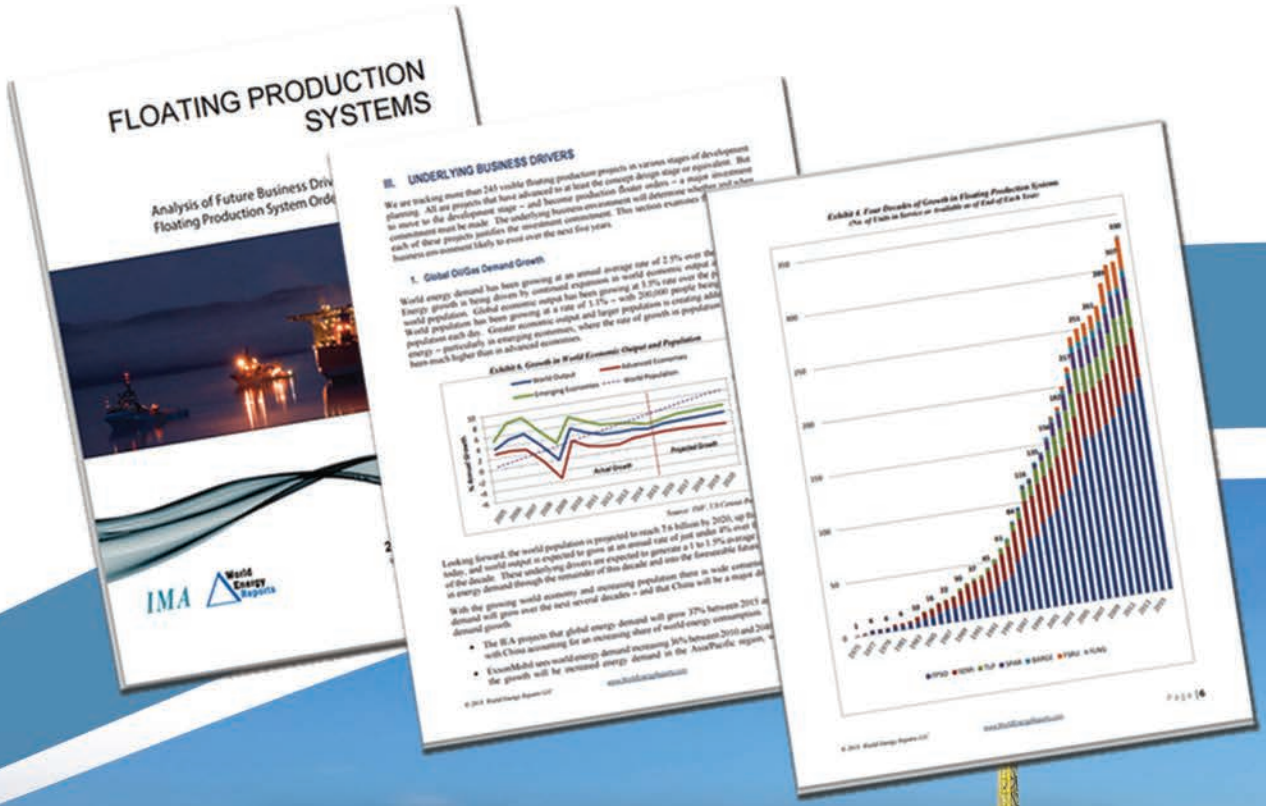

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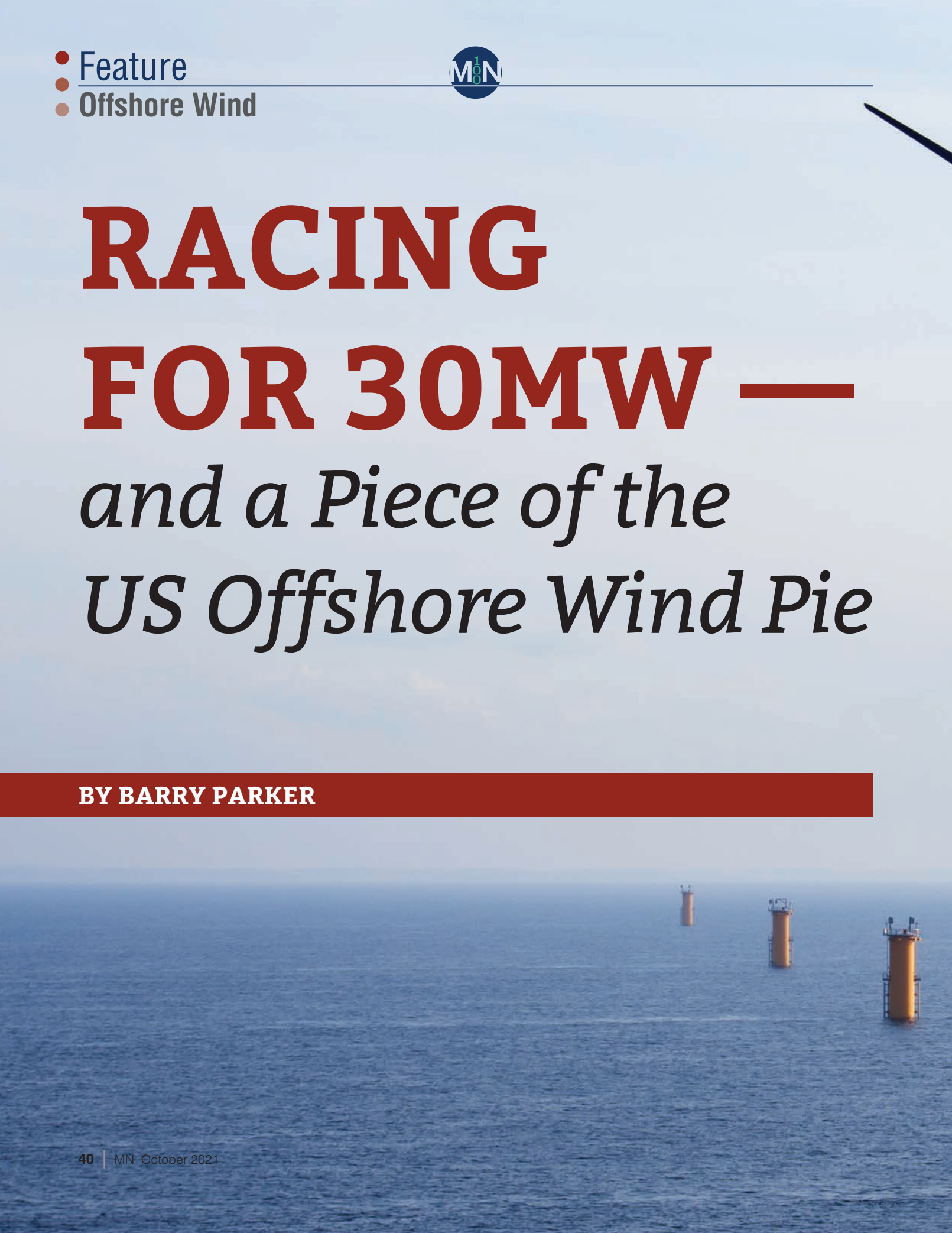
RACING FOR 30MW — *and a Piece of the US Offshore Wind Pie*

BY BARRY PARKER



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"30 by 30" is the rallying cry for all concerned with the burgeoning U.S. offshore wind business. In Spring 2021, the Secretaries of Energy, Interior and Commerce resolved to deploy 30 gigawatts (GW) of electricity generated from offshore turbines by 2030. Consultants McKinsey, in a recent article frame the value proposition for this clean fuel source, writing: "During the industry's 30-year evolution, costs have fallen so sharply that offshore wind now compares favorably with competing energy sources." For vessel owners, renewable energy brings opportunity.

The thrust of near-term U.S. activity will be in the waters of New England and the mid-Atlantic states, with Gulf of Mexico and West Coast also on the drawing boards. Initially, installations will be fixed to the ocean floor (analogous to jack-ups in the offshore oil and gas realm). At present, two small projects are generating a meager 42 megawatts (MW): from Block Island Wind (five turbines at 6 MW each) and a demonstration project, Coastal Virginia Offshore Wind, or CVOW (two turbines at 6 MW). The Biden administration, in contrast to its predecessor, has been eager to advance a renewables agenda, and has jumpstarted approvals processes for new installations that had stalled out prior to the inauguration earlier this year.

Offshore wind development is not without its challenges. Objections from affluent seaside residents led to the demise of the Cape Wind project in Nantucket Sound. More recently, flare-ups between, developers of the 132 MW South Fork Wind (a partnership between **Ørsted** and **Eversource**), and residents in Wainscott, Long Island, regarding the proposed onshore interface for electrical cabling) have been in the news. In numerous cases, offshore wind interests have worked to overcome objections from the fishing industry. The same South Fork Wind project (moving rapidly through the approvals process, and set to come online in late 2023) provides an example. Its developers announced collaboration with **Sea Services North**

GustoMSC

America, and its partner fishermen in Rhode Island, Connecticut and New York, to support safe navigation around the in and around South Fork Wind and two other projects: the 704 MW Revolution Wind project (online in 2025) serving Rhode Island and Connecticut, and the 924 MW Sunrise Wind project, located east of Montauk, which will serve New York. Sea Services North America in effect, puts fisherman to work "… provid[ing] scouting vessels and monitoring services to assist …project research vessels in successfully locating, identifying and avoiding fishermen's gear during pre-construction marine surveys. This partnership helped improve communication and co-existence during the surveys."

Ørsted and Eversource had suggested that more collaboration might be in the cards, at developments Ocean Wind (with Ørsted partnering with **PSEG** in a 1.1 GW offshore southern New Jersey) and Skipjack Wind Farms (with its first phase, 120 MW, serving the Delmarva Peninsula, coming online in 2026). Cooperation with the fishing fleets is also key to deliberations in Maine in advance of the Federal leasing process, where politicians have inched toward a deal keeping offshore wind further out from the shore.

Developers of these and other offshore installations are pushing ahead with a plethora of projects on the path to gaining requisite approvals and set to come online in the mid-2020s. The initial phase of Vineyard Wind (800 MW, a partnership of **Copenhagen Infrastructure Partners** (CIP) and **Avangrid Renewables**), which fell victim to regulatory inertia during 2020, gained environmental approvals from Bureau of Energy Management (BOEM) and other agencies. The Sunrise Wind project east of Montauk will be the subject of public sessions beginning in September, which will guide a subsequent Federal environmental review, in advance of further approvals from Interior and Commerce. Other projects moving through BOEM's process include Ocean Wind (1.1 MW, offshore New Jersey) and the Coastal Virginia Offshore Wind (CVOW) project, which could see as many as 200 turbines, producing 2,600 MW, or more, of electricity.

With project approvals comes vessel construction. Installation vessels attract headlines, with their hefty price-tags and limited supply (in the face of demand for installation for 1,500 + turbines in U.S. waters and many more internationally in the coming decade). **Dominion Energy**, the owner of the Coastal Virginia project, inked a deal with a lessor consortium (after laying out upfront payments prior to the December 2020 keel laying) to complete construction for a Jones Act compliant wind turbine installation vessel (WTIV) at Brownsville, Texas shipbuilder **Keppel AmFELS**. The price of the WTIV, named Charybdis, which will work for Dominion out of Norfolk on CVOW, after an anticipated 2023 delivery, is around $600 million including debt of roughly $550 million.

The existing U.S. projects saw workarounds with tur-

Edison Chouest Offshore

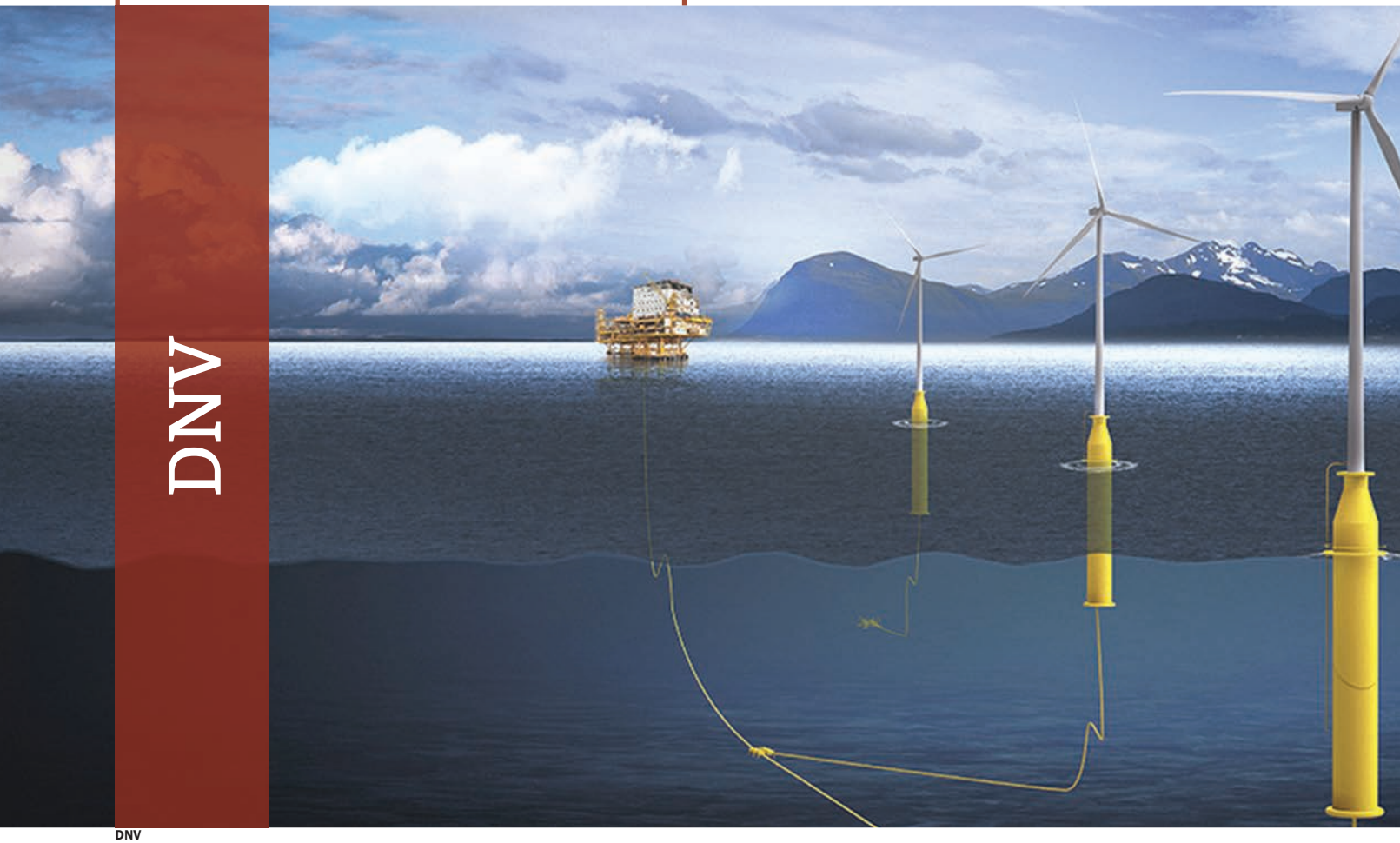
Edison Chouest Offshore

bines erected by European-owned WTIVs (with Jones Act compliant feeder barges), and will continue to do so. The installation phase of the already approved Vineyard Wind project will see the Belgian company **DEME Offshore** as contractor. According to a release from Vineyard Wind, "**Foss** [a U.S. company] will provide the Jones Act compliant feeder vessels, a concept by which the wind turbines will be transported from the port of New Bedford to the specialized DEME Offshore US LLC installation jack-up vessel." In late August, DEME Offshore announced that it would be upgrading the crane capacity on its jack-up Sea Installer (presently working on the Hornsea project offshore U.K.) to 1,600 tons, in advance of work installing Vineyard Wind's **General Electric** Haliade-X turbines (13 MW).

In addition to traditional, fixed structure offshore wind turbines, the U.S. is set to embrace floating options.

Jones Act WTIVs will be an important part of the installation mix up and down the coastline. Indeed, Charybdis will be put out on charter to Ørsted/Eversource, working out of New London, Conn., before going to work for Dominion off the Virginia Coast. Logistical considerations (and sourcing of U.S. manufactured components) will likely drive demand for additional WTIVs built and owned in the U.S.

The New York-listed WTIV specialist **Eneti** (recently in the news with its early August acquisition of Great Yarmouth, U.K. based Seajacks) has said that it is in discus-



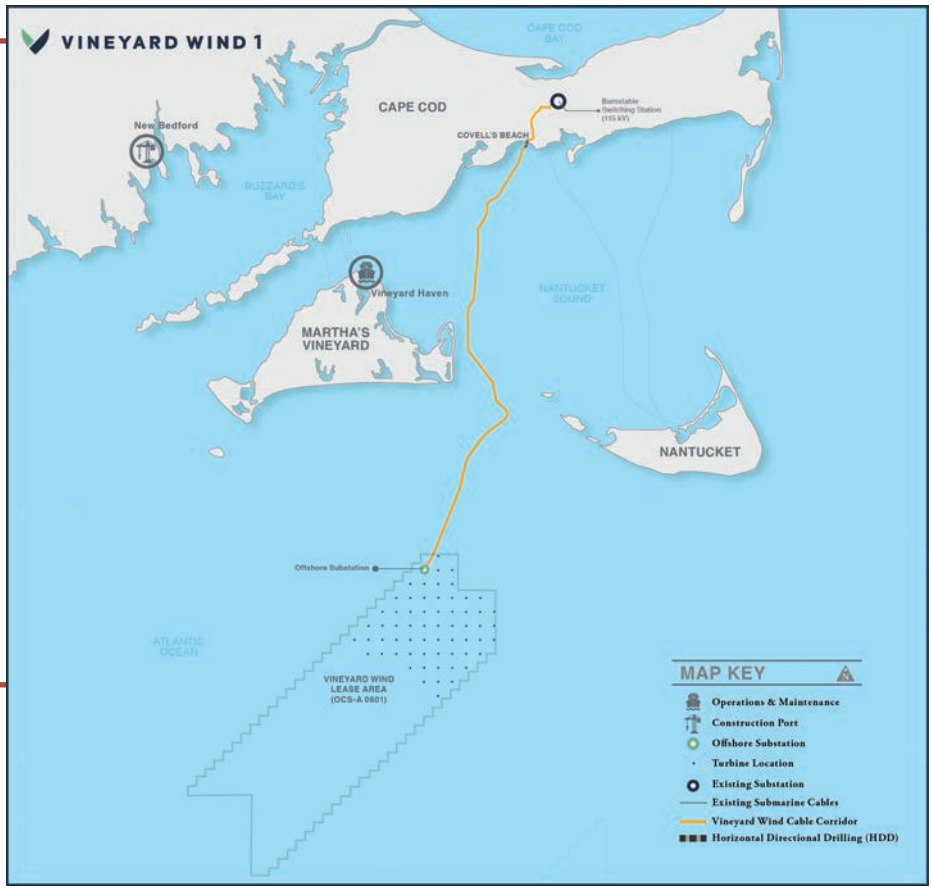
DNV

sions with U.S. yards regarding construction of a Jones Act WTIV. The company's chairman, Emanuele Lauro, said, in a May 2021 investor call, "We are intent on providing a state-of-the-art solution to our customers so that they can comply with the Jones Act as they bring renewable energy to the U.S. consumer." Eneti is building a $330 million **GustoMSC**-designed WTIV at Daewoo Shipbuilding & Marine Engineering Co (DSME) in S. Korea, for 2024 delivery; with a **Huisman** crane, installations of 20 MW turbines at water depths of up to 65 meters. will be possible, according to the company.

After installation, the need for servicing offshore turbines and electrical infrastructure will also create new business for U.S. yards and vessel operators. Ørsted/ Eversource, with multiple projects in the Northeast, have taken the lead when it comes to service vessels- contracting with oil patch stalwart **Edison Chouest Offshore** for construction of a service operations vessel (SOV), with a price-tag estimated to be around $80 million, at its multiple yards in the Gulf Coast.

Joint ventures between U.S. companies and European companies with wind expertise are an emerging template. **Østensjø Rederi**, the Norwegian operator with experience in the North Sea, has inked a joint venture agreement with U.S. service provider Foss Maritime (which is active in towing and ship assist, in addition to its barge ownership). **Crowley**, a Jones Act powerhouse which recently created a new subsidiary specifically to serve the offshore wind segment, has agreed to cooperate with **ESVAGT**, a Danish operator of more than 40 SOVs. Another company with offshore ambitions is **Green Shipping Line** (GSL), founded by Percy Pyne IV, a New York-based entrepreneur with shipping in his blood. GSL, aiming to build a vessel designed by **DEKC Maritime**

Vineyard Wind



Map of ***Vineyard Wind,*** *the first commercial scale U.S. offshore wind project.*

(Netherlands) with 2023 delivery, at **Moran Iron Works** in Michigan. **Keystone Shipping Company**, a veteran of the U.S. energy trades, would be slated to operate the vessel, according to announcements from GSL (which had also reportedly been in discussions with Norwegian/ German wind farm planners).

Facilities for vessels provides another set of challenges, effectively requiring the creation of an infrastructure—largely from scratch—to supply and service a burgeoning industry. "Local content" is often a stipulation in power purchase agreements typically funded at the state level. Yet such facilities don't lend themselves to economies of scale. Observers suggest that supply chains will evolve around a combination of "regional" ports (Norfolk, Va., South Jersey, and Narragansett Bay ports are examples), in conjunction with localized facilities. Besides New Bedford (where Vineyard Wind will be staged), examples would include Setauket, near Port Jefferson, which would serve as a base for Sunrise Wind's operations/ maintenance activities, or, in Connecticut- New London (slated to serve the Revolution Wind, and Sunrise Wind projects, both of which will be served by Charybdis, and the South Fork Wind project). Also, in the Nutmeg State, Bridgeport will be a hub for the Park City Wind development, with same owners as Vineyard Wind, to produce electricity from turbines located south of Martha's Vineyard. In Virginia, Dominion Energy has entered into a 10-year lease on 72 acres at the Portsmouth Marine Terminal, where turbines will be assembled before transfer to the WTIV. Part of the site was used as a staging facility by Ørsted, in the demonstration phase of the CVOW project.

Extensive survey activity has created employment opportunities for both U.S. and non U.S. survey vessels that might otherwise have been working in the oil and gas realm. Equinor (with partner **BP**) developing Empire Wind in the New York Bight, has hired a vessel from **Geoquip**, while the Dutch vessel Deep Helder (chartered from owner **Seamar** to contractor **MMT Group**), work-

Dominion Energy

ing out of New London, has been hired for Ørsted and Eversource's multiple projects east of Long Island. A trio of U.K registered vessels, Ocean Researcher, Ocean Endeavour and Ocean Observer, have been working off the New Jersey coast for Ørsted on its Ocean Wind and Skipjack Wind projects. **Tidewater**'s DP-2 PSV Regulus has also been working in the same vicinity, on the Atlantic Shores project (a joint venture of **Shell** and **EDF Renewables**).

Deeper and bigger are watchwords of the business on its path to "30 by 30". Eneti, the WTIV behemoth, explained in an August, 2021 presentation, "Offshore wind turbines are continuously increasing in size and capacity. While the largest deployed model is currently 9.5 MW, models up to 14-15 MW are set to be commercialized over the next few years," adding that "Offshore wind installations are also moving further from shore and into deeper water where better quality wind resources are available." They also noted, "Most projects commissioned through 2018 have been within 50 kilometers of shore, however, several large projects in the pipeline are 100 kilometers or more from shore."

Looking ahead, BOEM is in early stages of soliciting comments on a project offshore northern California. Because water depths in the potential lease site, 15 nautical miles out in the Pacific, range from 300 feet to 700 feet, floating turbines (assembled shoreside and then towed out to sea) would be deployed. Offshore Maine would also

likely see floating turbines. Offshore wind is expected to evolve much like offshore oil and gas, where shallow water jack-ups gave way to deepwater "floaters". In its late 2020 report on floating wind, class society **DNV** said, "Because floating wind can be deployed in any depth of water, it opens up these sites—bringing wind power in reach of much more of the world's population including the mega cities of Asia Pacific."

Though the ongoing push to renewable energy will see a big pivot from combustion to electrification, power generation does not stop with electricity. The Atlantic Shores project (which could eventually supply more than 2 GW of electricity), off the coast of Atlantic City, will include a pilot project to produce "green hydrogen" using offshore wind.

***DEME** offshore jackup installation vessel*

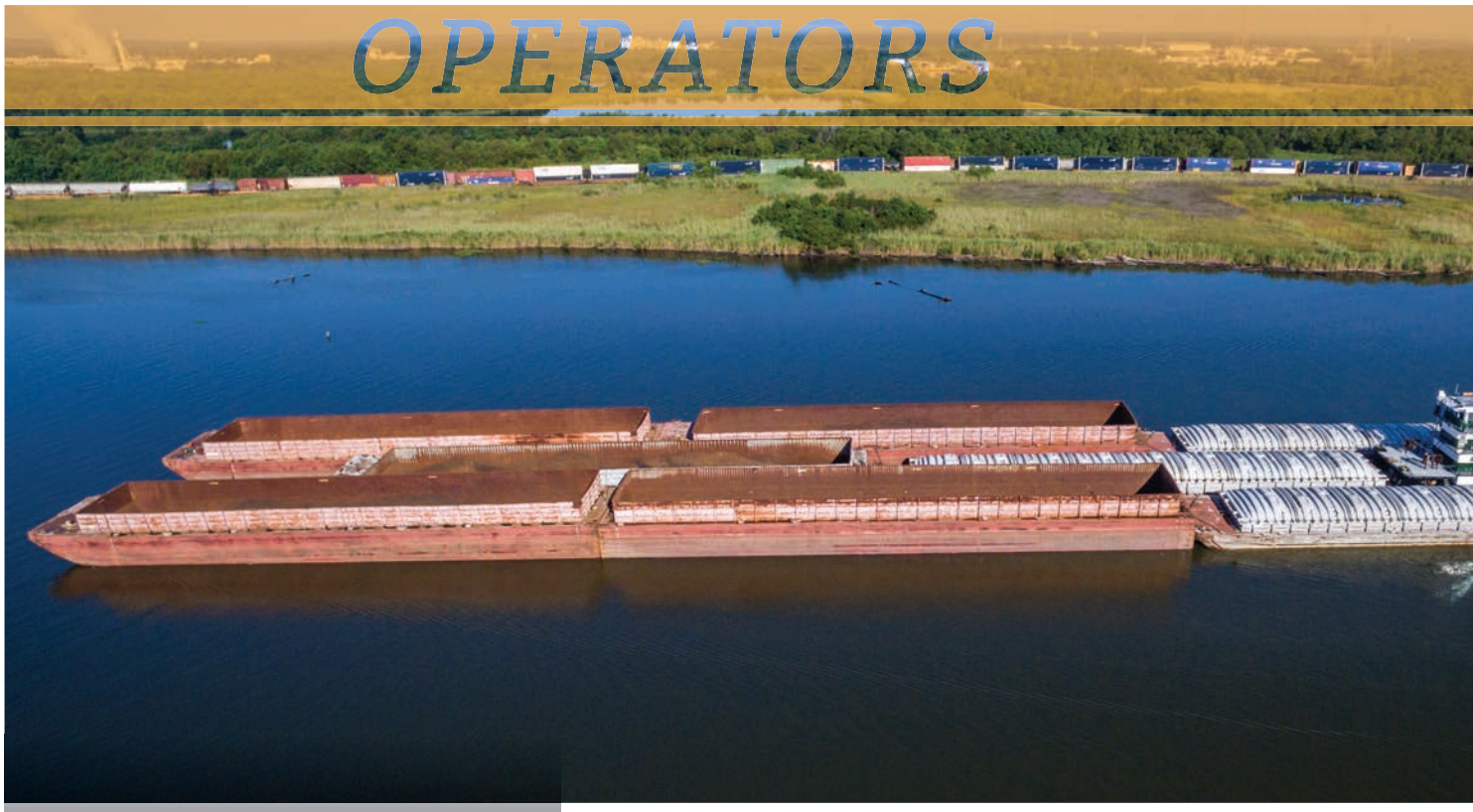
DEME

CTVs

In 2016, Rhode Island-based **Atlantic Wind Transfers** (AWT) put into service the U.S.' first-ever vessel purpose-built for offshore wind services. The 21-meter crew transfer vessel (CTV) Atlantic Pioneer was constructed by **Blount Boats** to serve America's first commercial offshore wind project, the five-turbine, 30 MW Block Island Wind Farm, which became operational in the final month of 2016. Last year saw the launch of two new Jones Act CTVs: **WindServe Marine**'s WindServe Odyssey and AWT's Atlantic Endeavor, built at **Senesco** and Blount respectively. CTVs are typically aluminum catamarans, used for transporting wind farm technicians and other personnel, and sometimes equipment, out to sites on a daily basis.

WindServeMarine

Atlantic Wind transfers



Cooper/T. Smith

The Cooper Group of Companies is anchored by one of America's oldest and largest stevedoring and maritime firms.

Established in 1905, Mobile, Ala.-based Cooper /T. Smith has operations on all three U.S. coasts and international operations in Mexico. The company maintains ownership in numerous satellite companies, forming the Cooper Group, including warehousing, terminal operations, tugboats, push boats, barging, barge fleeting, floating terminals, logistics, marine and timberlands, vessel repair and restaurants. The Cooper Group's experienced, action-oriented people, state of the art equipment and automated facilities provide customers with fast, efficient and cost-effective movement of cargo anywhere.

Crowley Maritime Corporation

Crowley is a U.S.-owned and -operated marine solutions, energy and logistics services company that provides services in domestic and international markets. The company was launched in 1892, by founder Thomas Crowley - the grandfather of current Chairman and CEO Thomas B. Crowley Jr. - and is now wholly and privately owned by the Crowley family and Crowley employees. Today, Tom Crowley and his leadership team direct a company with more than $2 billion in annual revenues, approximately 5,300 employees and a fleet of about 200 vessels.

Crowley Maritime Corporation in July announced plans to build and operate an all-electric powered harbor tugboat capable of completing a job without expending a drop of fuel—a first in the U.S. The 82-foot-long vessel, dubbed eWolf, will be built by Master Boat Builders in Coden, Ala. and operational at the Port of San Diego's Tenth Avenue Marine Terminal by mid-2023 and comes as Crowley and the maritime industry continue to make strides toward sustainability and decarbonization. Over the first 10 years of its use, the operation of the new e-tug will reduce 178 tons of nitrogen oxide (NOx), 2.5 tons of diesel particulate matter, and 3,100 metric tons of carbon dioxide (CO2) versus a conventional tug, according to Crowley, adding that the electric tug will replace one that consumes more than 30,000 gallons of diesel per year.

The company is also making a strong push into the burgeoning U.S. offshore wind industry. Crowley, which announced the formation of its New Energy division in

January, said many of its existing U.S.-flagged vessel assets, engineering and logistics services could quickly and easily pivot to support the offshore wind industry. In March, Crowley announced it is teaming up with Danish shipping company ESVAGT to build and operate purpose-built, Jones Act vessels to support the emerging U.S. offshore wind market.

The Hornblower Group

The Hornblower Group is currently in a period of major expansion, now with operations in 111 countries. Hornblower operates a fleet of about 200 vessels in three of those countries, through brands such as NYC Ferry, American Queen Steamboat Company, Alcatraz City Cruises and others. Its vessel operations range from overnight cruise ships, traditional small passenger vessels, high-speed ferries, water taxis, excursion vessels, high-thrill jet boats and even vessels for military contracts.

When the COVID-19 pandemic hit, some of the Hornblower fleet remained in service as "essential operations", but many vessels were brought to dock and out of service. As the world began to slowly open back up, Hornblower plotted its safe return to vessel operations. Certainly, this is no easy task.

According to Richard Paine, the group's vice president of HSSQE, one of the main challenges has been rehiring its vessel staff, which led Hornblower down a path toward improving the employee culture and experience. "[Now], as our employees come back and as we hire new employees, there's tracks for development and career paths that can prolong lengthy careers with us in the industry," Paine said.

Another difficult task has been training new and veteran crews amid pandemic-related shutdowns and restrictions. "We've introduced more digital technology-based training, computer-based training, online training. This has really allowed us to expand and be flexible," Paine said, noting that the digital component is just a piece of the puzzle, existing to compliment hands-on, onboard training. "Using Microsoft Teams, Zoom, online learning management systems allowed us to keep our crew coming back and being able to train on things that might have been done on board a vessel or in a classroom setting, now at their fingertips and a little bit with the comforts at home or in some of the offices that were reopened."

"Digital technology has become a staple of how we move

THE HORNBLOWER GROUP

forward with training, and COVID fast-forwarded that," Paine continued. "But it will never replace anything that's taken place on board the vessel. Our commitment is still to get a hand on a line, a fire extinguisher, go down to an engine room, do a round, see what working on a vessel is, because the one thing you'll never ever get, no matter how hard they try, from simulation to the newest thing from Amazon, is you never can get your sea legs when you're behind a computer on shore."

"When people come on board our vessels—be it in Mississippi or from New York or out in California or over in London—they know that they're going to have a crew that's trained, not only in some of the newest technology and having a chance to understand what that means, but at the same point, they didn't lose those traditional mariner skills that are necessary to work on a vessel."

McAllister Towing

New York-based McAllister Towing is a family-owned marine transportation company founded in 1864. Today, it operates a modern fleet of more than 60 tugs, barges, launches and ferries in over 13 locations along the U.S. East Coast from Portland, Maine to San Juan, Puerto Rico. And its fleet is about to become even more modern. In September McAllister announced it signed a contract for the construction of two new tugs to be built at Washburn & Doughty Associates (W&D) in East Boothbay, Maine, with an option for two additional vessels.

The 93- by 38-foot tractor tugs will each offer 84 metric tons bollard pull, further enhancing McAllister's East Coast fleet with the ability to service its customers largest ships and bring McAllister's tractor fleet to 39 tugs with a total of over 182,000 horsepower, the company said.

"McAllister Towing is expanding into the LNG and Windfarm markets and at the same time many of our customers are seeking services for larger capacity container vessels which makes the higher horsepower of these newbuilds necessary for our fleet's abilities, said Capt. Steven Kress, McAllister's Vice President of Operations.

Each 6,770-hp tug will be powered by 3516E Tier 4 Caterpillar engines with twin Schottel SRP 490 Z-drive units and Markey winches on the bow and stern. Sister vessel Eileen McAllister, delivered in 2020, achieved over 84 metric

tons during her ABS bollard pull certification, and McAllister said it anticipates the same or better performance.

"The Eileen since delivery has performed exceptionally in Port Everglades, Fla., and the proven design and build will suit our other ports very well," Kress said.

The first new boat is slated for delivery in November of 2022. The newbuilds will be the third and fourth tugs built at W&D for McAllister, bringing the total number of tugs in McAllister's fleet built at W&D to seven.

"America currently has a very robust economy and that begins in the ports where goods are imported and exported. McAllister is very proud to be a major contributing factor to that success. COVID restrictions hampered ship arrivals and port production, and hopefully once the backlog


MCDONOUGH MARINE SERVICE

of vessels is cleared and the box store shelves replenished, we can look towards lower inflation rates and further growth," Kress said.

McDonough Marine Service

Working in several markets to service civil construction, project cargo, oil and gas and general transportation, McDonough Marine Service is a 76-year-old leader in the marine transportation and logistics industry. As a complete solution provider, the company specializes in the charter of barges and tugs, and the coordination and management of cargo moves to support the successful execution of customers' projects. It owns the largest fleet of deck and spud barges in the U.S., ranging from a 400'x100' oceangoing deck barge all the way down to a 35'x12' work float. The company operates three major fleeting locations out of Belle Chasse, La.; Channelview, Texas; and Chesapeake, Va. These fleets are able to offer minor shipyard services including barge repair as well as prepping and cleaning. McDonough also operates 14 other fleeting locations including St. Louis, Mo.; Parkersburg, W. Va.; Chicago, Ill.; Staten Island, N.Y.; Charleston, S.C.; Savanah, Ga.; Jacksonville, Fla.; Port Manatee, Fla.; and several in Louisiana.

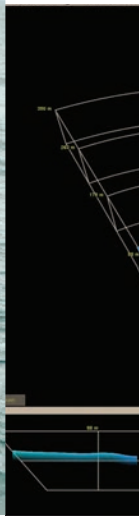
Vane Brothers

The Van Brothers Company is a marine transportation provider primarily responsible for moving petroleum products via tugboats, barges and articulated tug/barge (ATB) units. For nearly 125 years, the company has provided a wide range of maritime services that includes ship bunkering; the delivery of marine lubricants, stores, and non-potable water; and inspection of onboard safety equipment.

The story of Vane Brothers began in 1898, when Captain William Burke Vane and his brother, Captain Allen P. Vane, established a ship chandlery (providing nautical supplies) in Baltimore. Burke and Allen's cousin, Claude V. Hughes, joined Vane in 1920. Today, it is the fourth generation of the Hughes family that guides the company, which has become one of the nation's premier marine transportation providers. Still headquartered in Baltimore,

Vane Brothers operates approximately 50 tugboats and 80 barges out of multiple locations on the U.S. East, West and Gulf coasts, in the Great Lakes Region, and in the Caribbean.

For the first time in the company's 123-year history, Vane Brothers is operating vessels in the Great Lakes region. The Vane 4,200-hp tug New York and barge Double Skin 509A have been involved since early winter in the movement of asphalt on both sides of the U.S.-Canada border. This expansion is in addition to Vane's operations on the U.S. East, West and Gulf coasts, and in the Caribbean. Elsewhere in recent months, Vane has put two 3,000-hp newbuilds into operation: the Cape Henry model-bow tug and Rock Hall square-bow push boat. Both were constructed at Chesapeake Shipbuilders & Naval Architects in Salisbury, Md.



David Clark Company

David Clark Company has more than two decades of experience providing wired, wireless and digital boat crew headset communication systems. The firm's noise-attenuating headset systems are used worldwide in a variety of critical communication applications by civil and government personnel in the marine, aerospace, aviation, fire/rescue and industrial markets.

"Having served the marine industry for over 20 years, we're now seeing an increased emphasis on boat crew communications. The Series 9100 Digital Headset System is being perceived as a necessity, rather than an 'accessory' by many workboat crews due to its simplicity, versatility and mission flexibility," said Bob Daigle, David Clark Systems Manager.

The company's business is expanding internationally in a variety of markets including foreign navies and law enforcement agencies, fisheries and offshore service/transport vessel sectors. Domestic system installations are ongoing for the U.S. Navy, U.S. Coast Guard, U.S. Department of Homeland Security, National Oceanic and Atmospheric Administration, and U.S. Customs and Border Patrol interceptors.

David Clark Company also maintains ongoing relationships with a variety of OEM customers, comprised of leading international workboat manufacturers. These strategic alliances help to enhance its products and systems to handle today's increasingly sophisticated mission protocols and marine communication applications.

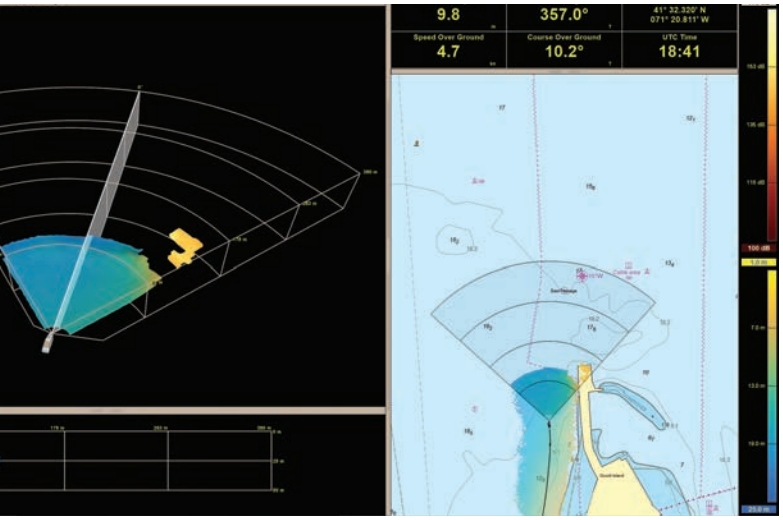
FarSounder

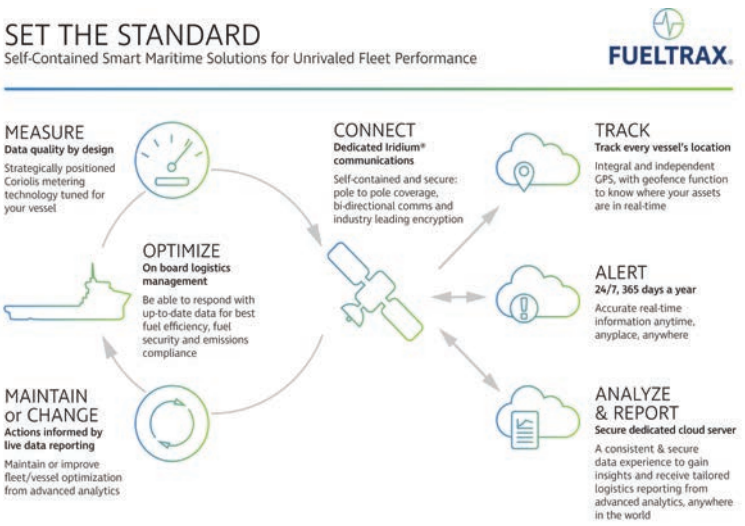
This year marks two decades that FarSounder has been dedicated to developing its unique 3D forward looking sonar technology (3D FLS). Back in 2001 the firm's founders saw a need for a solution to answer the question, "What is in front of my vessel underwater right now?" This real-world issue has since been mitigated with the company's innovative Argos navigation sonar systems capable of generating a true, three-dimensional image ahead of a vessel in real-time. Today, this patented technology is deployed in all of the world's oceans working to keep vessels safe, detecting shallows and obstacles in the water column. Available in three options—the Argos 1000, Argos 500 and Argos 350—all systems in the Argos Series improve navigation safety by detecting underwater hazards and shallow bottoms up to 1,000m ahead of the vessel, and speeds up to 25 knots.

FUELTRAX

Compatible with any vessel, engine, or fuel in any location in the world, the FUELTRAX smart fuel management system is designed to reduce onboard fuel consumption costs, emissions and set the standard for secure, compliant and optimized vessel performance. Each FUELTRAX installation includes access to the cloud-based data analytics service, FUELNET, allowing vessel owners to benefit from real time data insights into their vessels fuel consumption, operations

FARSOUNDER





and utilize optimization tools in the web portal to consume less fuel and reach their net-zero carbon emissions goals. Currently installed on more than 600 vessels, with zero failed installs, FUELTRAX delivers an over 99% system uptime globally and is the only electronic fuel management system (EFMS) accepted universally by all major oil companies.

Furuno

Furuno has been at the vanguard of marine technology since its inception in 1948, when the company commercialized the world's first fish finder. With service centers and authorized distributors worldwide, Furuno continues its role as a leader in marine electronics with the innovation of new technologies.

The NXT line of Solid-State Radars is among the more exciting evolutions in marine technology today. Furuno's decades of Radar innovation have cumulated in a new lineup of radar products for ships of any size that are powerful, precise, and easy-to-use. No other manufacturer offers a Solid-State IMO Radar in both S-Band and X-Band configurations for SOLAS vessels, making the NXT series truly a class unto itself. Incredible target detection at all ranges combined with Furuno's superior signal processing techniques to deliver a radar presentation that is clean and uncluttered with minimal need for adjustment. With a single button press, the ACE (Automatic Clutter Elimination) function can activate, automatically adjusting filter and gain

FURUNO

GPLINK

controls according to sea and weather conditions to provide the very best radar presentation. Furuno's Fast Target Tracking (FTT) acquires targets and immediately displays a speed and course vector, with the information becoming available in mere seconds. FTT gives navigators more time to assess the situation with accurate, reliable information, and make a decision to take action, avoiding incidents at a very early stage. NXT's new InstantAccess bar gives the operator immediate access to the tools they need to quickly and efficiently perform tasks. With a new, brushless motor and no magnetron to replace, the NXT Solid-State Radars require far less maintenance and over time, saving thousands of dollars and hours of downtime over the life of the radar.

GPLINK

gplink provides remote monitoring, tracking and diagnostic solutions that enable owners and operators to remain connected to their fleets remotely. Engine performance, operator habits and fuel consumption are all tracked, and engine problems can be identified early for planned downtime. Information is electronically logged for seven years, making for easy compliance reporting. gplink provides remote monitoring, tracking and diagnostic solutions for high horsepower systems. gplink utilizes dual band technology with GSM communications, as well as the Iridium satellite system for location tracking, monitoring, and emergency notification systems. gplink uses both of these extensive networks to provide worldwide coverage, and ensure that connections are not only reliable but affordable too. gplink protects vessels by monitoring engines and onboard critical systems, including engine diagnostic codes, all while tracking the precise location of the vessel anywhere in the world. gplink is available for commercial vessels and fleets, as well as pleasure craft vessels. Passenger vessel fleets such as Boston Harbor Cruises, Bay State Cruises, NY Waterways, HyLine Cruises and Alcatraz Clipper work with gplink for remote monitoring, diagnostics and tracking.

PHOENIX LIGHTING

Intellian Technologies

Founded in 2004, Intellian Technologies is one of the world's top providers of satellite antennas and terminals, with a mission to empower connectivity for the world. A

recognized leader in maritime satellite communications, Intellian is the trusted provider of worldwide connectivity solutions for VSAT, L-band terminals and satellite TV systems, using state-of-the-art RF antenna technology. With the launch of its compact range, Intellian is accelerating the availability of fast, reliable communications for everyone. Building on the success of its first compact VSAT, the v60E, Intellian launched the v45C in April 2021. The v45C leverages the latest developments in antenna and satellite technologies to deliver outstanding VSAT connectivity with a space-saving 45cm reflector, housed in a compact dome. Of key value is the v45C's modem-agnostic operation, freeing users from permanent service contracts. Teamed with superb RF performance, the antenna delivers global, high-speed data and voice communications in a space-efficient, cost-effective manner. The v45C has been shown to deliver optimal results on High Throughput (HTS) and widebeam Ku-band networks, which for customers means reliable, fast connectivity, fit for today's data-intensive online activity.

Phoenix Lighting

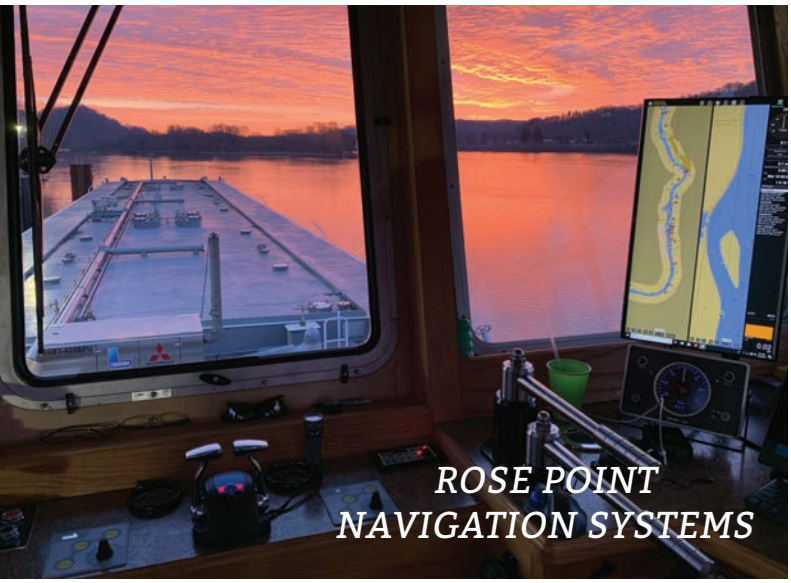
Phoenix Lighting has a rich history dating back over 127 years in the city of Milwaukee. Since 1892, it has thrived in a number of different industries, and today is a trusted authority for tugboats, workboats, ferries, dredges, military service vessels, research vessels and barges that need reliable, sustainable lighting. Its American-made, marine grade exterior and navigation LED lights for inland and offshore vessels are designed to endure constant vibration, large temperature variances and the corrosive marine environment. Phoenix's LED lighting reduces costly maintenance and improves safety for the maritime industry.

Phoenix recently introduced the SturdiSignal Series of LED navigation lights that are modular and are manufactured in the U.S. The design allows for tool-less repair in minutes, to eliminate costly maintenance and reduce overall vessel operation costs. With a spare LED module kept onboard, a vessel can always remain safe and compliant with COLREGS, ABS and UL1104. The lights feature a double head autonomous option that automatically alternates LED heads to double the lifespan of a light and will switch to an alternate head if one fails/falls below required visibility. The series can replace existing navigation lights or be specified into the design of a new vessel along with an alarm panel that provides additional information and warnings.

Rose Point Navigation Systems

Rose Point Navigation Systems was founded in 2003 by an ex-Microsoft software development manager with a passion for boating and creating software, and today the Redmond, Wash.-based company is a leading provider of reliable, easy-to-use navigation solutions for professional mariners and recreational boaters.

The company's electronic chart system (ECS) is its primary product, engineered to improve operational efficiency, situational awareness and decision making with straightforward, uncluttered displays and controls that provide instant access to the information professional mariners and fleet operators need to navigate safely. Rose Point ECS is an industry-leading navigation software and the number one selling navigation software for inland vessels in the United States, according to the company. And Rose Point Navigation Systems has a close working relationship with USCG, USACE and NOAA,


ROSE POINT NAVIGATION SYSTEMS

SEA MACHINES

resulting in reliable availability of navigational charts and navigation publications for the users of Rose Point ECS.

Sea Machines

Michael Johnson is the founder and CEO of Sea Machines, a company that is helping to fast track the age of autonomy in the maritime space. "Technology is not something new for our space," Johnson said, "be it from the lumbering packet ships to heavily canvassed clippers then back to the lumbering, smoking, yet consistent steamers and then on and on. Now it's digital sensing, deep processing and the shift of manual operation to the autonomous."

A native Texan and a marine engineer by education, Johnson has always fancied himself an innovator, but early in his career – from shipyard post to executive leadership at Crowley Maritime – he never imagined in those early years that he would take a leadership role in maritime autonomy. "Mariners aren't usually the type of people that make long-term fixed plans," Johnson said.

But it was one of his first experiences as a mariner that helped shaped his mission, his company, today. "On my first trip to sea as a cadet, within 10 days of stepping on board my first ship, we were engaged in a major search and rescue operation in the North Atlantic" Johnson remembers. "We were searching for a missing bulker, the Marika 7 that had recently left Nova Scotia, and we were sailing within 12 hours of each other in the same winter storm. Unfortunately, she broke in half and all crew were lost. And we were searching in the waters, in 45-ft. seas. That was when I first learned how dynamic and powerful the seas are."

Fast track to 2012, with Johnson in a leadership position at Crowley and Titan Salvage, where he led the team that wrote the winning bid to recover the wreck of the Costa Concordia. "Over the course of those 19 years from that first voyage to the Costa Concordia, I saw that simple and wrong human decisions can have catastrophic consequences. While humans are great at many things, I see humans as not being optimal in other ways. In our world, the marine world of long duration missions, which are often routine, technology can take on more and do it better."

With that, Sea Machines was effectively born. Sea Machines in in its seventh year, with offices and facilities in four countries, a team of more than 50 personnel with more than 50 autonomy systems booked by companies in nine different countries. Born in the commercial space, Sea Machines is also making inroads with government customers. "It turns out that the U.S. Department of Defense and their U.S. tax paying stakeholders have an appreciation for homegrown technology that has been proven in the commercial world," Johnson said. When one starts taking the US DoD and autonomy path, one usually starts running into the realm of long-tenured, giant corporations. "A quick-moving venture capital backed company like ours needs to wisely

chart our course," Johnson said. "Part of that is through the relationships we have in the industry. And you see the partnerships that we've jointly announced going back to 2018 with AP Moller Maersk, and then last year major strategic alliance with Huntington Ingalls and Hamilton Jet and this year with Damen." (Note: at press time Rolls-Royce and Sea Machines signed a partnership agreement to cooperate on smart ship and autonomous ship control solutions).

"Autonomous operations will be mainstream," Johnson said. "I doubt there are many that question that. The challenge, especially for a startup innovation company like ours, is time."

Taking a historical perspective, Johnson reckons that most major technological shifts at that commercial or industrial grade level take 15 to 25 years from beginning to an over 60% adoption rate. As the speed of all technological evolution accelerates, he sees autonomy coming faster than normal. "The challenge for the innovator is being steadfast and being capitalized well enough to weather that period from concept to commercial tipping point. That's probably the reason that a lot of the legacy technology companies that serve our space are mammoths: they have the capital to weather it." In the meantime, Johnson and the Sea Machines team will continue to experiment, trial and innovate.

"We have some great things in the pipeline," Johnson said. "We will also be launching and releasing our computer vision as a navigational sensor, which this will be the first of its kind. With vision technology, your vessel can detect range and classify obstacles in a way that no other sensor on the market can. It was a must for us because we leverage the conventional sensing technologies today, but it's not enough for a system to clearly and competently perceive the full domain. So, vision is that answer."

APPLETON MARINE

CARVER PUMP

Appleton Marine

An employee-owned company for over 30 years, Appleton Marine, Inc. designs and manufactures a wide range of custom marine offshore and shipboard products and specializes in integrating this equipment with ship systems. Not only does Appleton supply cranes, winches, windlasses, capstans, hose reels, and other special systems, they are experts in combining the gear into a cost-effective turnkey solution. The company provides handling solutions for commercial/military shipbuilding, offshore oil, and many other market segments. It offers the advantage of being a single-source supplier for all the customer's deck machinery needs including cranes, winches, hydraulic power units, etc., reducing the customer's total ownership cost during equipment start-up/commissioning, and later if a spare part or service is required. Appleton Marine also offers build-to-print services and has extensive experience working on projects for the U.S. Government. Recent build-to-print equipment includes UNREP gear for several U.S. and foreign Navy programs and Slewing Arm Davits (SLADs) for the U.S. Navy.

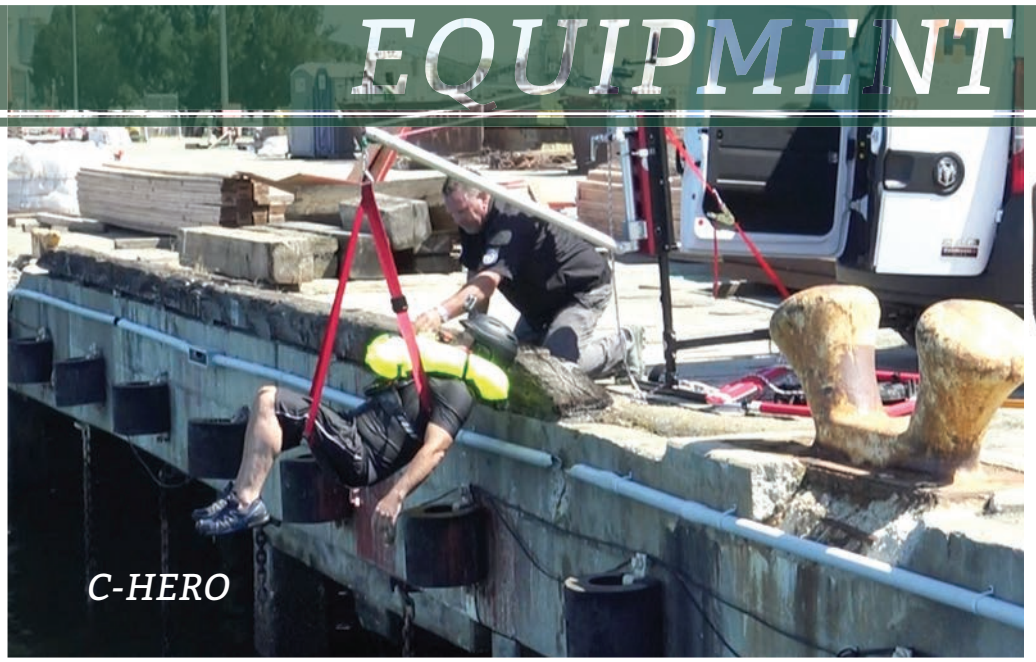
Carver Pump

Carver Pump is headquartered in Muscatine, Iowa, where its pumps are engineered and manufactured. The company, now under third-generation family ownership and commitment to American manufacturing, has been recognized since its inception as one of the leading centrifugal pump companies, building to the most demanding engineering specifications and military standards in the world. Carver Pump has been part of every major U.S. Navy program since World War II.

The firm's is addressing the most challenging performance requirements using advanced design tools: the latest solid modeling software for analyzing structural problems, and exceptional hydraulic design capabilities. It has refined its expertise by delivering tens of thousands of pumps into a wide variety of applications, routinely developing new products for very specific usage, such as its tank-mounted 855 Series and new naval ship systems, for example. Many of Carver's standard products can be highly customized for specific OEM applications, such as parts-washing systems and boiler/heat-exchanger cleaning systems. Whether the challenge is pump efficiency, difficult suction conditions or extreme environments, Carver Pump will engineer a solution to meet user goals for reliability, quality and performance.

C-Hero

C-HERO innovates man overboard recovery products, designed by a tugboat captain, specifically for the tugboat industry. Its system allows for an underway one-person recovery of a helpless person from the water. The company's president, Shane Smith, was born into the tugboat busi-



C-HERO

CYGNUS INSTRUMENTS

ness and never left. He brings to the company 30 years' captain experience, a wealth of on deck knowledge, a passion for the water and saving lives and a desire to make a difference in MOB recovery.

The company started with the bitt mount rescue davit and has grown to offer a full product line for all vessels, including land-based rescues. This year, C-Hero delivered the first in industry HR-12 Rescue Pole + Body Sling which lifts the person in water (PIW) in a horizontally seated position, which avoids constricting the chest. This is accomplished with the company's existing VR-12 Rescue Pole so current poles can be upgraded without having to purchase an entirely new system. Innovation never stops at C-Hero, and the firm is currently working on an alternate bitt mount rescue lifting davit that will be completed by the end of October.

Cygnus Instruments

Cygnus Instruments manufactures the "original" digital multiple echo thickness gauge. Multiple echo means that coatings, such as paint or epoxy, do not have to be removed in order to measure the metal. Cygnus gauge give true, accurate, verified thickness measurements. Cygnus has spent 35 years in the marine survey business, offering a variety of gauges for shipboard/barge work that are designed to measure internal corrosion, heavy external corrosion, cast iron metals, anchor chain and plastic. All gauges are simple and easy to use and all have Mil Std 810 certification for durability and water tightness. Cygnus will soon release a new Intrinsically Safe thickness gauge featuring Multiple Echo, Echo to Echo to, Single Echo, data logging, A-scan and B-scan gauge that will be certified for use in potentially hazardous atmospheres without the fear of causing explosions in Class 1 Group A, B, C and D Division 1 Zones 0, Zone 1. This gauge will be approved for use by OSHA

DMW Marine Group, LLC

DMW Marine Group has been supplying marine cranes of all types to the military, offshore petroleum producers and service providers, oceanographic survey and research vessels, aquaculture, yachts, police and fire departments, etc. for over 30 years.

The Chester Springs, Pa.-based company has a complete range of cranes—all specifically engineered and manufactured for hoisting operations in marine environments requiring heavy-duty design and the ability to withstand a strong side load force. DMW says it has more standard models and sizes available, in all configurations, than any other supplier, and claims customization is the company's strength. DMW has provided marine cranes to all industries; from a small 15-foot aquaculture boat to 750-foot navy ships, and everything in between. Over this past year, DMW Marine Group has supplied marine cranes to several university research vessels, offshore wind companies, U.S.

Navy contractors , mega yachts and offshore oil drillers.

In addition to its main headquarters, DMW has a 50,000-square-foot facility in Houston, complete with sand blasting, paint booth, welding and machine shop.

IPD

IPD offers quality and reliable engine overhaul repair parts. Since 1955 IPD has manufactured and distributed a comprehensive line of heavy-duty engine repair component, including pistons, liners, piston rings, bearings, gasket sets, installation parts, bushings, camshafts, connecting rods, valvetrain components, oil and water and oil pumps. IPD parts are thoroughly re-engineered from OE parts to ensure that the highest-level specifications are developed and maintained. IPD is known for carrying engine replacement parts for Caterpillar, Cummins, Detroit Diesel and Waukesha applications.

In the last year IPD began offering cryo-treated head bolt kits for Caterpillar's C15 and C3500 engines. Adding cryo bolts to the head bolt kit results in longer bolt life with less internal stress and optimized tensile strength. Cryogenic heat treatment is a precisely engineered process of taking materials down to approximately -310 degrees F, keeping them at that temperature in liquid nitrogen to remove residual stresses, and then ramping temperature back to room temperature, followed by a mild heat treatment process. These bolts are made and cryo-treated in the U.S.

RSC Bio Solutions

As a leader in green technology, RSC Bio Solutions' advanced performance products have provided the shallow draft market with better solutions for over 20 years of field tested, proven use. The company offers best-in-class lubricants, greases, cleaners and degreasers with environmental compliance without compromise. Its lubricants offer extreme protection against water and the elements and deliver long term lubricating stability, resulting in more uptime and reduced operating costs so operators and contractors can focus on getting the job done.

RSC Bio Solutions is a portfolio company of Blumenthal Holdings and a global leader in sustainable technology for marine and industrial markets with four decades of

R.W. FERNSTRUM & COMPANY

experience in the most demanding applications. The company is committed to helping global operators reduce environmental risk, increase uptime and chart a path to a more sustainable future with technologies that rival the performance and compatibility of the best petroleum-based products.

RSC Bio recently introduced a trio of new high-performance grease products specifically formulated for the marine industry to deliver water resistant lubrication with extreme anti-wear performance and corrosion protection without environmental compromise.

R.W.Fernstrum & Company

R.W. Fernstrum & Company has been a pioneer in the maritime industry since its founding in 1949, setting the standard both with its heat exchangers and customer service. The company has continued to improve its product through extensive customization options to meet customer needs, having also partnered with companies such as WEKA Marine B.V., Tranter and Omega Thermo Products to extend its product range. The manufacturer of the GRIDCOOLER® keel cooler and North American manufacturer of WEKA Boxcooler provides effective, custom engineered heat exchangers for the marine industry across six continents and over 50 countries. And the company has both custom as well as CNC equipment that allow it to fabricate both standard and custom heat exchangers.

R.W. Fernstrum counts among recent notable projects the Gretchen V. Cooper with Blakeley BoatWorks for Cooper Marine and Timberlands; M/V Rock Solid with Master Marine Inc. for Plimsoll Marine; Trailing Suction Hopper Dredge for Weeks Marine with Eastern Shipbuilding; Trailing Suction Hopper Dredge for Great Lakes Dredge and Dock with


VIEGA, LLC


WALKER ENGINEERING ENTERPRISES

Conrad Shipyard; and M/V James V Glynn and M/V Nikola Tesla for Maid of the Mist. Its new partnership with Omega Thermo Products is helping to bring Laser Plate to the maritime industry.

Viega, LLC

The Viega Group, with a tradition of innovation for 120 years, has more than 4,000 employees worldwide and is among the leading manufacturers of pipe fitting installation technology. In metal press systems for industrial, commercial and residential projects, the company is a global market leader. In the U.S., Viega LLC employs over 650 people and offers more than 3,000 products. Viega also specializes in the design, production and installation of radiant heating and cooling systems, and offers Viega Flushing System Technology including carriers and flush plates.

Viega offers numerous different systems for wide-ranging applications on ships and offshore – including CuNi systems for seawater, copper and stainless steel for drinking water, heating and cooling or press connectors for thick-walled steel pipes. Thanks to the efficient press systems, there is no need for complicated joining techniques such as welding, soldering and thread cutting. And press technol-

ogy offers significant benefits with regard to occupational safety as well. In some cases, it can mean that firewatch personnel are no longer required to supervise hot work, while extensive preliminary work, platforms and scaffolding can also be eliminated. And if a connection accidentally remains unpressed, there is no risk of any problems. In systems with the Viega SC-Contur, the unpressed connection is guaranteed to be found during the tightness test, regardless of whether water, compressed air or inert gases are involved – and in any pressure range.

Viega MegaPrss CuNi and ProPress recently became the first press fittings to be approved by Naval Sea Systems Command for use on Navy combat ships.

Walker Engineering Enterprises

Walker Engineering Enterprises (Walker AIRSEP) is a leading manufacturer of diesel engine crankcase fumes disposal systems and high-performance air filters and intake silencers, supplying OEM engine manufacturers, and US Navy with high quality CCV and air filtration products since 1989, often included as standard factory equipment. The firm offers a wide range of CCV AIRSEP systems for any size diesel engine for propulsion, gensets or auxiliary engines, and specializes in high performance air filtration systems for commercial transport, military, government and fishing vessels. New systems for large displacement engines are available, including the only production manufactured CCV system rated for 5,000 horsepower.

W&O Supply

For over 45 years, W&O has been a top source for valves, automated valves, pipes, fittings, engineered products and automation with over $60 million in stock worldwide. Over the years, W&O has broadened its offerings to include value-added engineering solutions including actuation expertise and assembly, consultancy, and project-management organization.

Founded in 1975, W&O operates its global branch network from Jacksonville, Fla. The network includes 12 locations in the U.S., two in Canada, and one each in the Netherlands and Singapore. With steady growth over the years, W&O has expanded its products and territories and is now one of the world's largest suppliers of valves, automated valves, pipes, fittings, engineered products and automation to both the marine and upstream oil and gas industries. W&O is a go-to solutions provider in all segments, including commercial shipping, fishing, cruise and ferry lines, barge owners, upstream oil and natural-gas rigs, and shipyards that build and repair vessels of all sizes as well as the U.S. Navy, Military Sealift Command, MARAD, U.S. Coast Guard.

CHRISTOPHER WIERNICKI

ABS

ABS is one of the world's largest classification societies, with thousands of employees worldwide driven by a mission to promote the security of life and property and preserve the natural environment. A founding member of IACS, the organization serves both the global marine and offshore sectors. ABS offers technical support during the design, construction and operation of commercial marine assets, providing the tools and services that can extend their operational lifecycles. The strong global safety record of the ABS-classed fleet illustrates the group's commitment to protecting people; as an organization, consistently setting industry benchmarks for class safety. Globally, ABS says it continues to develop the innovative products and services that safely address the key challenges associated with digitization and connectivity, cyber-security, performance optimization, reducing operating costs, and environmental compliance.

For the U.S.-based brown-water fleet, the past several years saw the implementation of the most comprehensive safety and environmental legislation in the sector's history, the U.S. Coast Guard's (USCG) Subchapter M regulations. ABS has been at the forefront of independent technical support for that important regulatory rollout, with oversight of about a third of the vessels affected by Sub M. In fact, the first vessel owners to receive USCG COI's demonstrating SubM compliance, on all three U.S. coasts were ABS clients. ABS has been contracted to verify the Sub-M compliance of more than 2,200 vessels since the start of that important regulatory rollout.

Advanced Mechanical Enterprises

Advanced Mechanical Enterprises (AME) is a machinery and mechanical services company that specializes in vibration diagnostics and precision alignment of propulsion systems using state-of-the-art equipment and procedures. Since its inception in 1992, the company has been commissioned worldwide to consult on some of the most complex vibration/noise and alignment projects for a variety of applications, including those on workboats, yachts, pumping stations, power plants and manufacturing facilities. With vibration analysis, diesel engine condition monitoring, shaft torque and power measurements, ultrasonic and infrared technologies, the company can pinpoint exactly what issues machinery is experiencing, or what components need to be addressed to prevent unforeseen downtime and outages. Once data is analyzed, AME has the knowhow, equipment, resources and expertise to correct it. Whether laser, strain gage, optical or

feeler gage, AME will get the alignment straight. When one-size-fits-all isn't an option, AME's two fully equipped machine shops can fabricate, balance, machine, weld and line bore customized solutions. AME also provides hydraulics service and repair on stabilizers, steering systems, thrusters and more.

The American Equity Underwriters

The American Equity Underwriters, Inc. is the program administrator of the American Longshore Mutual Association Ltd., a group self-insurance fund authorized by the U.S. Department of Labor to provide USL&H coverage for the liabilities of its members under the United States Longshore & Harbor Workers' Compensation Act. AEU works with insurance brokers to provide USL&H coverage to employers who are members of ALMA, including shipbuilders, ship repairers, marine terminal operators, stevedores, marine contractors and other waterfront businesses. With a history rooted in maritime, AEU is keenly aware of the challenges faced by waterfront employers and has carefully built services and teams around loss control, underwriting, and claims handling to directly address the challenges and intense regulation these employers face. More than 1,400 waterfront employers – the largest of any USL&H provider – trust the experts at The American Equity Underwriters, Inc. with their longshore workers' compensation needs.

Baxter Marine Group

A newcomer to the maritime industry is looking to make waves. Baxter Marine Group was founded in 2021 by the leadership team that revolutionized maintenance, inventory, and compliance software in the aviation industry. Now the company seeks to revolutionize the marine industry with products ranging from proactive maintenance solutions to damage control. In January, Baxter Marine Group acquired Vessel Vanguard, WheelHouse Technologies, and SeaKits Damage Control, with the goal to provide products and services that focus on marine safety and marine safety management. In September, Baxter launched its new Vessel Vanguard Pro and Vessel Vanguard SMS platforms geared for the large vessel owner and commercial fleets. The same team that built the company's aviation platform has designed and built the new VV platforms, providing a comprehensive solution where forms, communications (alerts, emails, etc.), reporting and compliance forms are integrated into one platform - with an e-signature capability.

Creative Systems, Inc.
Software for Naval Architects

Creative Systems, Inc.

Creative Systems is the originator of GHS, the well-known PC-based simulator of vessels in fluids and fluids in vessels. GHS is a software system for the design and evaluation of all types of ships and floating structures. It addresses flotation, trim, stability and strength by calculating the forces involved using mathematical/geometrical models of the vessels. Developed by Creative Systems, Inc. specifically for today's computers, GHS has become widely recognized as the most productive tool of its kind. It is continually being extended and improved to ensure its continued leadership and excellence in response to increasing sophistication of stability standards and computing technology. GHS is well-proven, reliable, respected by regulatory agencies and in constant use by major design firms and shipyards. GHS is truly general-purpose. Not only does it handle ship hulls, but also anything that floats or contains liquid - or both. It has been used to analyze and/or design submarines, SWATHs, dry docks, drilling platforms, 10-foot sailboats, 300-meter freighters, floating bridges, and even a floating golf green. GHS addresses simple and complex stability issues including intermediate stages of flooding, spilling of cargo, and optimizing against complex stability criteria.

FINCANTIERI MARINE SYSTEMS

Fincantieri Marine Systems

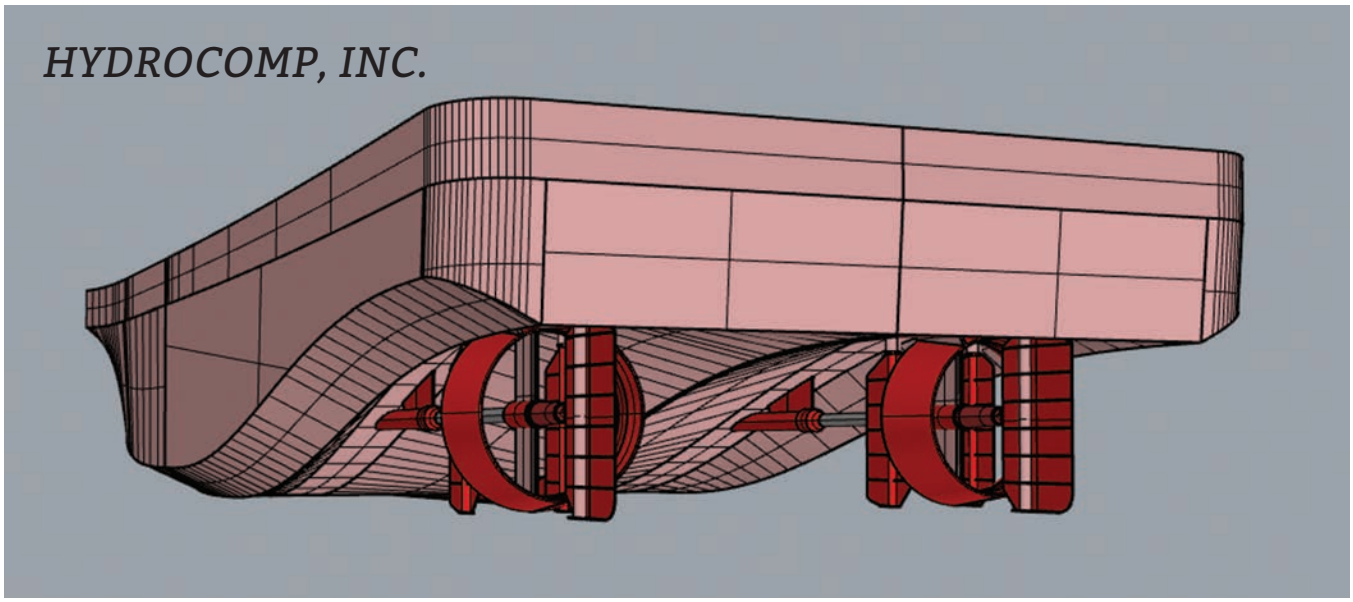
Fincantieri Marine Systems North America (FMSNA) are expert technicians and maintainers of maritime systems, such as propulsion, power generation and related condition-based monitoring systems. From program management and engineering services on the front-end to troubleshooting and complete life-cycle support, FMSNA provides support to a range of clients including, most notaby, the U.S. Department of Defense. FMSNA has been awarded a multiple award contract (MAC I) to support sustainment efforts for Littoral Combat Ships (LCS) homeported in Mayport, Fla. FMSNA was one of two companies awarded for a five-year $1.3 billion Indefinite Delivery, Indefinite Quantity (IDIQ) contract as the Navy seeks competition and value for service to the LCS fleet. This award gives FMSNA the opportunity to bid on individual delivery orders for the Freedom variant LCS, including planned, continuous, emergent, and complex maintenance availabilities, as well as corrosion control and facilities maintenance throughout the world.

FMSNA brings expertise in integrating propulsion and machinery systems to a ship's hull form, offering high quality, "best value" to their clients. As opposed to mere hardware vendors, FMSNA's added value comes from being system engineers that deliver a fully integrated pack-

age. FMSNA as "the propulsion plant integrator" takes full responsibility for the performance of the machinery and will be a single "go to" entity for all propulsion system details. The company does it all: engineer, integrate, source, purchase, install, test, and deliver to satisfied clients all over the world. FMSNA has service centers located within close proximity to important naval bases in Norfolk, Va.; Mayport, Fla.; Manama, Bahrain and Sasebo, Japan.

HydroComp

HydroComp, Inc. in Durham, N.H. was established in 1984 to provide engineering tools to develop ships, boats, and other marine vehicles – and their propellers – more efficiently and responsibly. Leading the industry in applied hydrodynamics and propeller design for more than 35 years, HydroComp expertise in performance analysis, offering design tools and consultancy services that guide designs toward responsible, efficient vessel operations. The Vessel-Propulsor-Drive system model is the foundation of optimized performance via



the industry's gold-standard tool for Speed/Power Prediction, Operational Energy Analysis, and Propulsion System Sizing. HydroComp's flagship product NavCad, and now PropElements, provides ship operators and their designers worldwide, with tools to determine their carbon footprint, identify fuel-efficient systems, and in the mitigation of underwater radiated noise. HydroComp Propeller Tools; PropCad and PropExpert, offer commercial systems for propeller design for manufacture and propeller application sizing.

HydroComp continues to evolve with the needs of the maritime community. Through its broad range of technical services to companies large and small, coupled with a progressive internal research and design program, the company is able to offer technical services that are at the cutting edge of contemporary knowledge and expertise. HydroComp is often called upon for assistance with inland river craft and pushboats, and due to this increased need, it has further developed its products and services to specifically address hull form optimization, determining bow wave height and underwater hull clearance.

JAX LNG

JAX LNG is North America's first small-scale coastal liquefied natural gas (LNG) facility, located along the St. Johns River in Jacksonville, Fla., with both on-road and marine-loading capabilities servicing the marine, rail, drilling, mining, trucking, power generation, aerospace and industrial markets.

JAX LNG completed construction of Phase I in late 2018 and has been in operation ever since. An expansion of JAX LNG (Phase II) is currently underway. Once completed, Phase ll will double the LNG storage capacity and triple liquefaction at the facility located at Dames Point near Jacksonville.

JAX LNG recently completed the first fueling of a marine vessel in the United States with a blend of LNG and renewable LNG (RLNG). The blend was loaded into the Clean Jacksonville bunker barge to fuel the Isla Bella, the world's first LNG-powered containership put into service by TOTE Maritime Puerto Rico in 2015. Element Markets supplied the renewable natural gas (RNG) used to produce the RLNG via renewable thermal certificates (RTCs). Using RLNG to fuel marine vessels is a readily available pathway to net-zero emissions by 2050. RLNG's emissions profile as a maritime fuel is superior even to that of LNG, which already reduces greenhouse gas emissions by more than 25% over ultra-low sulfur diesel.

Decarbonization of the transport sector has greatly accelerated through the use of regulatory incentives such as the alternative fuel tax credit, which encourages companies to adjust operations and make investments in assets that

SERVICES

KEVIN HUMPHREYS

reduce carbon intensity.

Produced from the decomposition of organic waste, RNG is compatible with existing natural gas infrastructure, providing a practical and replicable source of energy that mitigates and repurposes carbon emissions. For this bunkering event, RTCs were matched to the physical LNG loaded into the Clean Jacksonville to create the RLNG/LNG blended product.

JAX LNG is the long-term supplier to the two LNG-fueled container vessels—the Isla Bella and the Perla del Caribe—that TOTE Maritime Puerto Rico utilizes to reliably transport goods between Jacksonville and Puerto Rico.

Lloyd's Register

With $1 billion in turnover and 7,100 employees globally, classification society Lloyd's Register is on a mission to grow. Earlier this summer it tapped Kevin Humphreys to lead its Americas business, which includes 30 offices in 14 countries, 571 employees and about $60 million in annual revenue.

A key focus area for the group is in the digital realm. "One of the places we're investing significantly is platforms, digital platforms, both on our internal processes, and as that flows out to the external processes for our customers. We want to be able to deliver bread-and-butter services to our customers seamlessly, painlessly and efficiently," said Humphreys, LR's Marine and Offshore President. "How do I squeeze out efficiencies? How do I reduce emissions? How do I have compliance that's fair and equitable across the board? Digital technology help to do that and more."

"One of the biggest things is remote surveys. Of the approximate 30,000 surveys that we do in a year, about a third of those are done remotely via video feeds and remote inspections. This is where we're leveraging that technology to get the job done and to make it much more efficient," Humphreys added. "You're going to see more and more digital data coming in from various engine OEMs and process equipment OEMs, digital data that's aggregated in a core platform that your class society will be able to use in the course of inspections and risk management."

MOPS Marine License Insurance

MOPS Marine License Insurance, based in Long Beach, N.Y., has been protecting the USCG licenses, livelihoods and professional reputations of mariners across America since 1935. MOPS provides its policyholders with defense of their USCG-issued licenses following a covered marine casualty. For one low annual premium payment, MOPS policyholders are assigned an experienced maritime attorney who represents them from the first report of casualty through any and all administrative proceedings and, if necessary, appeals. Providing unlimited license defense and optional income protection, civil legal defense and professional liability coverage, MOPS is in the corner of professional mariners, having successfully defended over 10,000 USCG licenses. Underwritten by Lancer Insurance Company, which is rated "Excellent" by the A.M. Best Company, MOPS is the longtime leader in marine license insurance because it provides unrivaled protection against a full range of professional and financial risks.

Water Quality Insurance Syndicate

In 1971, the Water Quality Insurance Syndicate (WQIS) was established by 27 American marine insurers as a specialist pollution facility to insure vessel pollution risks and to address liabilities imposed by the United States through the Water Quality Improvement Act of 1970 and other significant legislation. WQIS has since expanded its operations to offer insurance products to protect owners and operators for their pollution liabilities worldwide. Today, with 50 years of experience, WQIS is a leader in the vessel pollution insurance market, offering comprehensive coverage, an experienced underwriting and claims department and effective response team. WQIS continues to be comprised of highly rated and experienced insurers, is well financed, assisted by knowledgeable committees, can boast top tier assureds, and is highly regarded worldwide. The strength of the Syndicate today is an attestation to the continued value provided by past and current leadership, subscriber members and broker partners. WQIS has been involved in more vessel pollution events than any other marine pollution insurance provider. Delivering where and when it counts, WQIS offers its clients unparalleled experience and professional reputation in underwriting, spill management and claims handling. Its team is available to assist in the event of a discharge and throughout the entire spill response—crucial for mitigating damages to the environment and assisting clients to quickly return to operational status.

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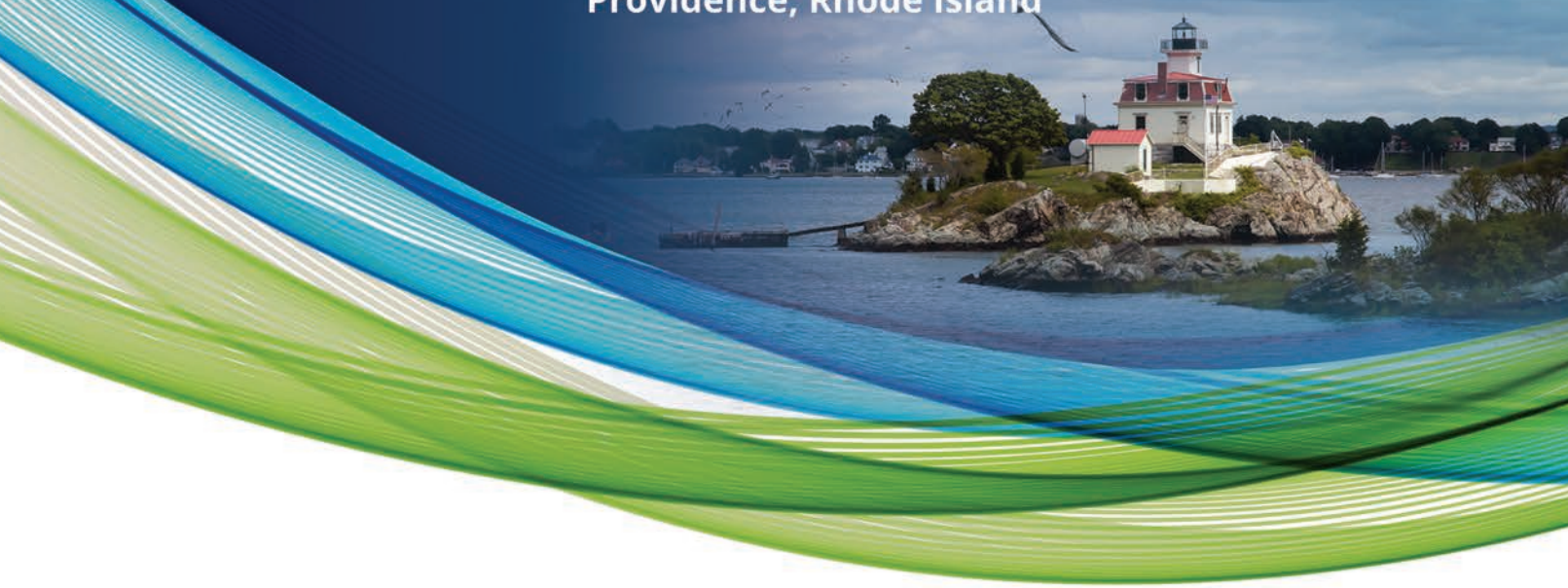

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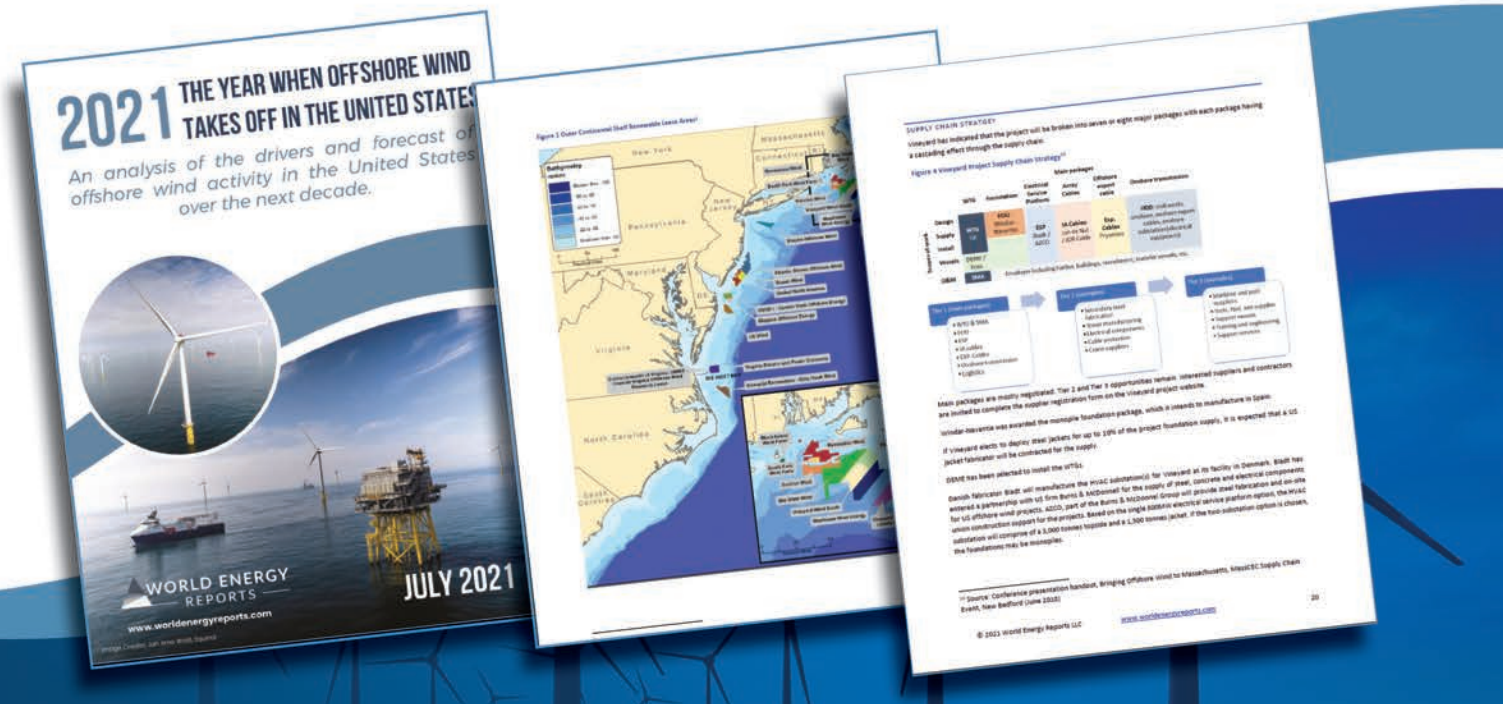

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