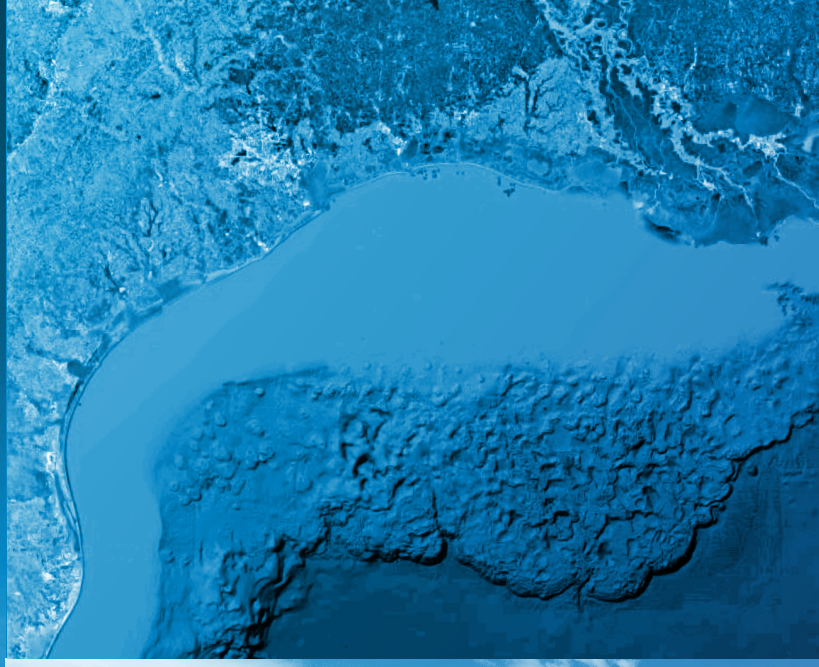

THE BUSINESS NETWORK FOR OFFSHORE WIND

UNLOCKING THE GULF OF MEXICO'S OFFSHORE WIND ENERGY POTENTIAL

An Examination of Existing Supply Chain Capabilities and Challenges

Authored by:
The Business Network for Offshore Wind's Gulf of Mexico Working Group
In partnership with the GNO Wind Alliance, facilitated by John Begala and Sylvana Gregg

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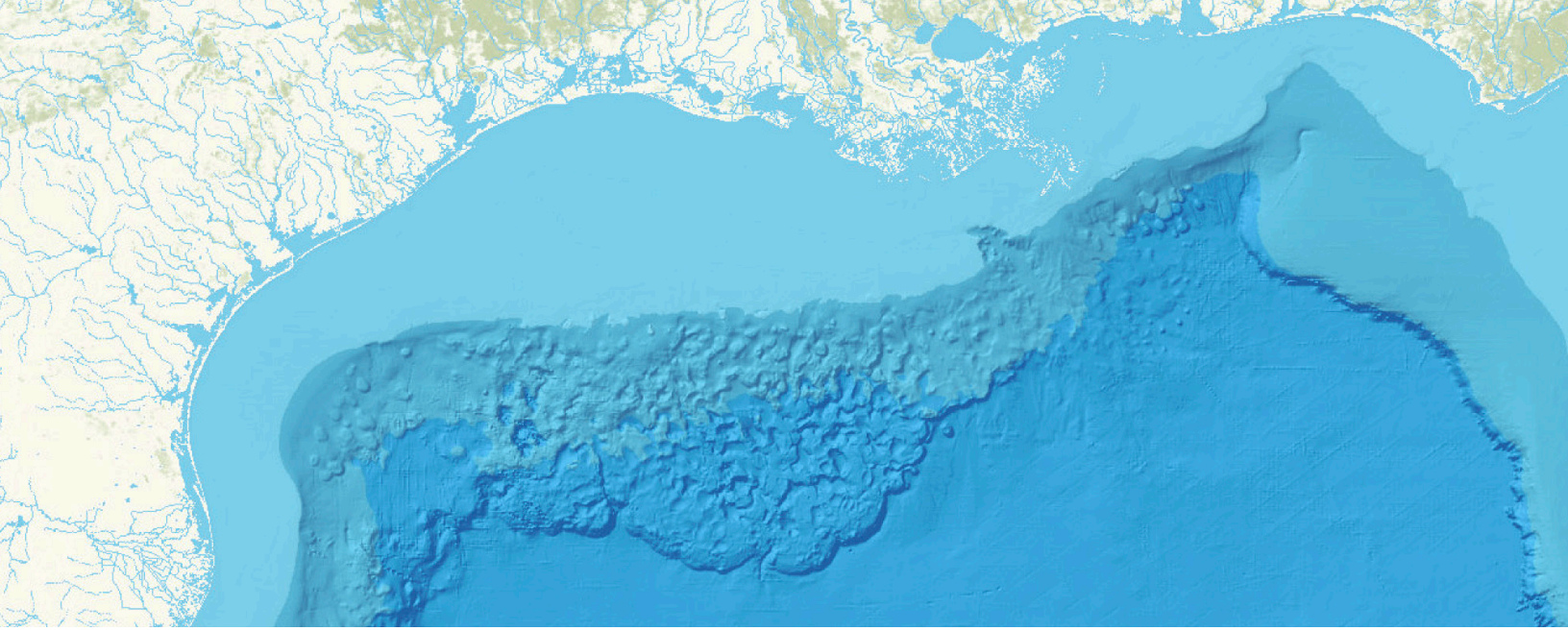

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The views expressed in this publication may not reflect the individual views of all Gulf of Mexico Working Group members.

INTRODUCTION

The first offshore wind lease areas in the Gulf of Mexico will be offered for sale on August 29, 2023, an event that marks the latest step forward for a growing industry that just this year shifted from demonstration to commercialization with two projects under construction in the Northeast. Yet, the auction is also an indication of the fertile ground for clean energy projects that exists in the Gulf and forecasts the strong potential for future opportunities.

Once the U.S. Bureau of Ocean and Energy Management (BOEM) executes these three lease areas, companies in the Gulf will have their opening shot to showcase their unparalleled expertise in offshore energy development — skills that have been honed over decades in the heart of America's oil and gas industry. This is a welcome development both for a rejuvenation of economic activity on the Gulf Coast, as well as an opportunity for decarbonization in some of the most hard-to-abate sectors of our economy.

The Gulf has already played its part in offshore wind's 10-plus years in the U.S. by providing critical offshore construction experience. This knowledge, bolstered by American business ingenuity paired with European expertise, and the dedicated work of U.S. federal and state policymakers, has advanced projects up and down the East Coast. And the region still has more to give.

With its long history of offshore construction, engineering expertise, environmental monitoring, and data collection, introducing the Gulf and the region's experienced professionals to the offshore wind market will advance new innovations and opportunities for the industry. Existing infrastructure such as shipyards, ports, and rail linkages to the American heartland, combined with a well-trained workforce, and strong coastal infrastructure will drive this transition and efficiently yield offshore wind projects at a declining price point. Simultaneously, federal policy measures such as the Infrastructure Investment and Jobs Act (IIJA) and the Inflation Reduction Act (IRA) have created major incentives to develop a carbon-neutral hydrogen economy, which promises to become the emerging energy commodity of the future. These incentives, combined with the pre-existing advantages enjoyed by the Gulf, make the value proposition for offshore wind in the Gulf very clear.

These opportunities, however, are not without their challenges. The offshore wind industry must learn how to maximize electricity production in a lower-than-average wind speed environment while deploying a bankable (certified) hurricane wind-resilient blade design. Design and construction activities will be required to take into account extensive dormant infrastructure and a thriving ecosystem. Finally, a clear market for offshore wind power must be established in both Louisiana and Texas.

Throughout the course of this white paper, the Business Network for Offshore Wind will walk through the opportunities for offshore wind in the Gulf, its associated challenges, and the many companies working to make this vision a reality. In doing so, it will become clear that the basis for many of the solutions we need are already beginning to come together. However, full realization of its potential will only come through consistent and coordinated effort between private sector leaders, state policymakers, and federal policymakers.

Background

BOEM facilitates the leasing process for offshore wind in a thorough and extensive manner. The Gulf of Mexico Wind Energy Areas (WEAs) include three proposed Lease Areas off the coasts of Galveston, Texas and Lake Charles, Louisiana.[1] The WEAs were published in a Proposed Sale Notice (PSN) by BOEM on February 24th, 2023 which then triggered public comments and an environmental review process. In this process of data collection and public engagement, BOEM was able to address concerns with the lease areas and amend them before the Final Sale Notice (FSN) would be published. The Final Environemtal Assessment (EA) concluded with a Finding of No Significant Impact (FONSI), and finally On July 21, 2023 the Final Sale Notice for the Gulf of Mexico lease was published into the federal register, with the lease sale set for August 29th, 2023.

Once developed, these WEAs could support up to 3.7 GW of offshore wind generation. Despite having no active lease areas, the Gulf has been a leader in developing the U.S. offshore wind supply chain. The Network reports that 23 percent of contracts in the U.S. market are going to Gulf firms and approximately $1 billion in investments are flowing to Gulf shipyards or fabrication yards. These remarkable figures were recently highlighted in a CBS News segment covering the construction of the first American-built Service Operation Vessel (SOV) for offshore wind, the ECO Edison. The

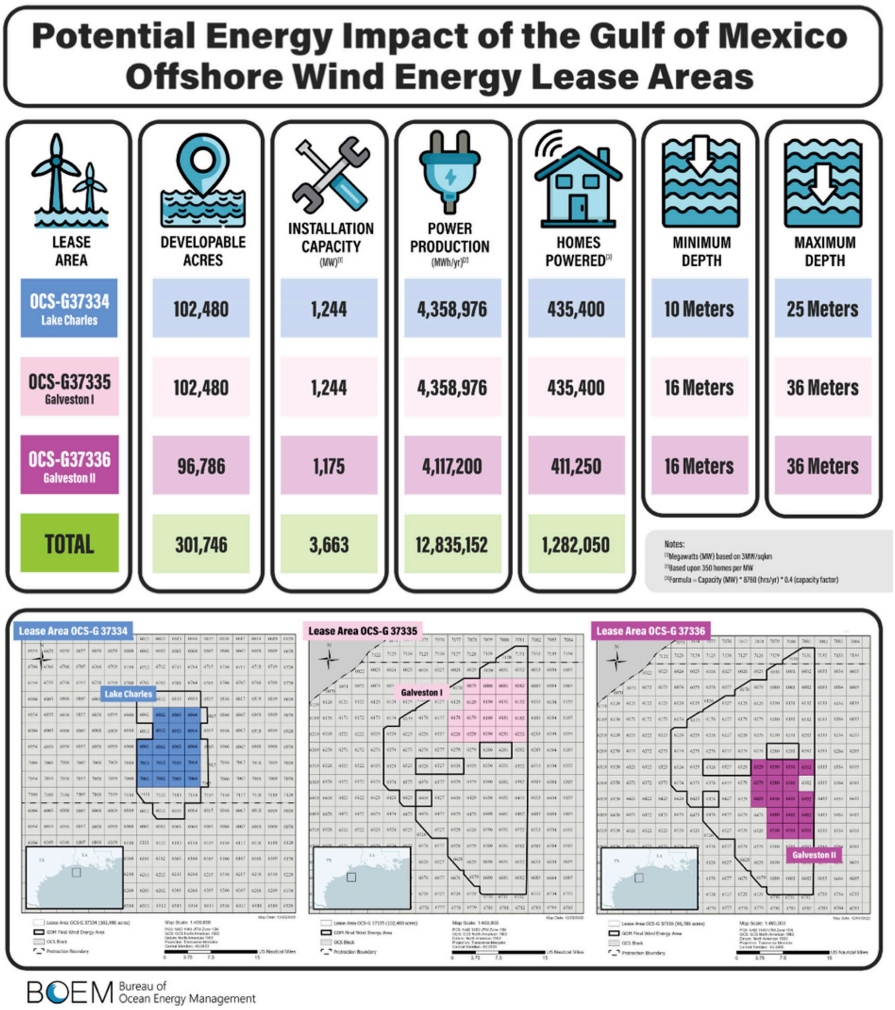


Figure 1: *Potential Energy Impact of the Gulf of Mexico OSW Energy Lease Areas (BOEM)*

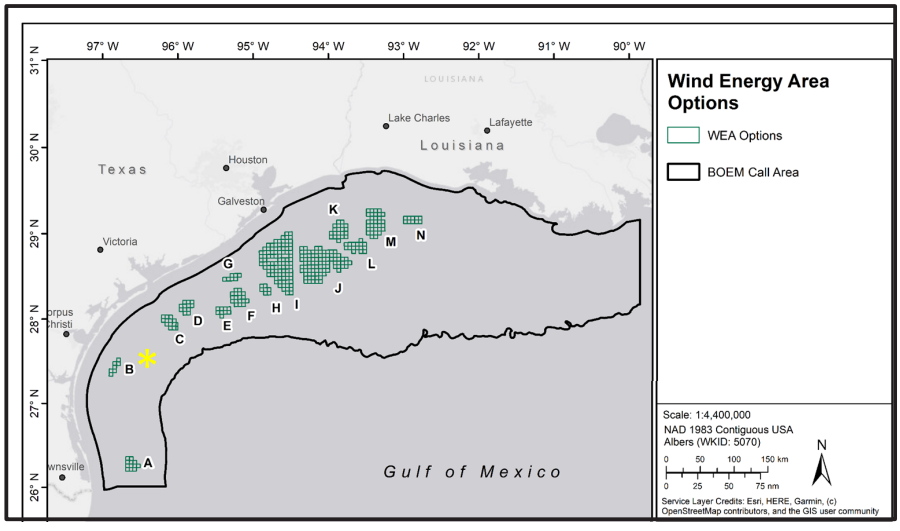


Figure 2: *13 WEA options from the model output. Area B is no longer an option due to a later DoD assessment requesting its removal.*

[1] https://www.boem.gov/renewable-energy/state-activities/gulf-mexico-activities

Background (cont.)

ECO Edison is currently being built by Edison Chouest in Houma, Louisiana. BOEM's inclusion of the supply chain, workforce, and fishery bidding credits demonstrates their continued commitment to seeing offshore wind develop in an equitable and inclusive manner.

This initial round of leases, set for August 29, is a step forward for offshore wind energy development in the Gulf. The Business Network for Offshore Wind anticipates that there will be additional leases in years to come, thanks to BOEM's diligence in the scoping process. As seen in the Figure 2, provided by BOEM,[2] there are more WEA options than the ones that are up for sale this summer. These other WEA options allow for an opportunity to establish a regular annual cadence for offshore wind leasing in the Gulf. In turn, this would allow for more confidence in supply chain development and provide potential bidders the assurance that even if they are unsuccessful in securing a lease area in this first round, there will be future opportunities to enter this new market.

GNOwind Alliance

The GNOwind Alliance is a no-cost program managed by the Southeast Louisiana regional economic development organization Greater New Orleans, Inc. (GNO, Inc.), and has a membership base of over 250 member organizations and 450 individuals representing ports, fabricators, manufacturers, environmental advocates, training centers, marine transportation entities, as well as state and local agencies. Reach out to Program Manager, Cameron Poole, to learn more at GNOwind.org.

GNOwind Alliance members hail from across the State of Louisiana and share a vision for working together to harness South Louisiana's potential as a driving force, and helping hand, for regional and national offshore wind deployment. GNOwind also works with national partners like the Network to facilitate open dialogue across critical actors in the energy industry, and is actively supporting workforce development programming with higher education partners, coordinating supply chain strategies, activating membership around prudent legislative endeavors, supporting state planning efforts in close coordination with the Louisiana Department of Natural Resources, and other efforts designed to accelerate sustainable offshore wind industry formation in South Louisiana.

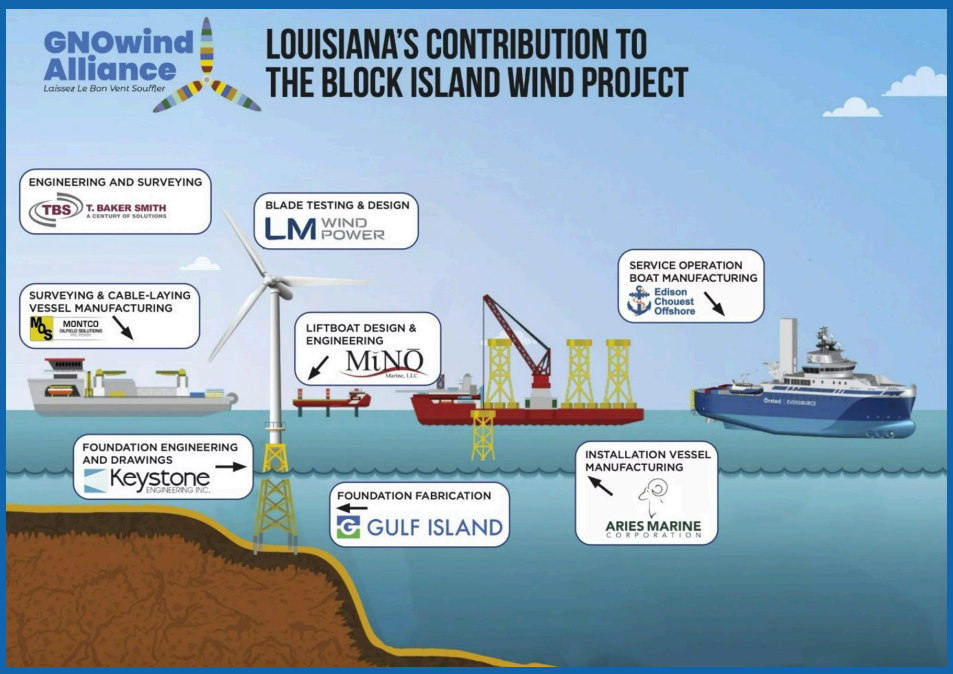


Figure 3: *Louisiana's contribution to the Block Island Wind Project (GNOwind Alliance).*

GNOwind includes international partners like RWE Renewables, who joined in May 2022 to help establish an offshore wind supply chain and supplier database in Louisiana to accelerate usage of local suppliers for GOM and national developments offshore. This is set to be released alongside the BOEM auction on GNOwind.org.

[2] https://www.boem.gov/sites/default/files/documents//Draft%20Area%20ID%20Memo%20GOM%20508.pdf

Regional Supply Chain Capabilities

There has been much talk of the supply chain expertise of the Gulf of Mexico, and one-off news articles occasionally highlight success stories. However, to truly understand the unique opportunity for offshore wind in the Gulf, you've got to dive deep into the people and places that make this region unique.

The supply chain in the Gulf of Mexico has been long developed and crafted with expertise from various stakeholders, long before offshore wind was proposed for the region. Most of these companies have been operating for many years throughout the booms and busts of the offshore oil sector. With the renewable energy revolution fast approaching, many businesses are beginning to recognize that their unique expertise is of immense value to offshore wind developers, and that opportunities abound to diversify their portfolios.

Over the course of this paper, we will follow the various stages of offshore wind development and identify some examples of companies that are already taking active measures to diversify their business models to meet the coming demand. These businesses have been the heartbeat of the Gulf for many decades, and they will play a central role in the decades to come. By leveraging their expertise, the offshore wind industry can boost local economies, drive down costs to energy consumers, and come up with innovative methods to develop an offshore wind farm.

PLANNING & PERMITTING

After BOEM completes its auction, and lease areas are awarded to the successful bidders, work will soon begin on the planning and permitting of the wind farms. This phase requires an in-depth site assessment, financing, and all necessary regulatory approvals. This phase is both lengthy (5-7+ years) and costly. Commencing with field surveys, stakeholder engagement, and front-end engineering design (FEED), and concluding with final permitting approval, this phase of project development offers countless opportunities to apply the lessons of the past decades of offshore energy development in the Gulf. Hopefully these lessons will lead to a more efficient and thorough process, cutting down the delay between the issuance of a lease and the beginning of project construction, while not lessening the quality of environmental review.

Law firms, environmental consultants, and engineering firms all play a critical role in this phase of project development. For example, the law firm of Jones Walker[3] has decades of experience in renewables, oil and gas, and maritime industries and provides full-spectrum legal counsel on all aspects of offshore wind projects. They specifically offer guidance for vessel owners, operators and charters, and provide guidance for developers, contractors, and suppliers, across the East Coast, West Coast, and Gulf of Mexico, including the potential development of offshore wind farms within Louisiana state waters.

T. Baker Smith[4] is a professional services consulting firm, headquartered in Louisiana, but also with offices in Texas and Mississippi. They possess environmental, survey, and engineering expertise to support clients, and worked on America's first offshore wind farm off the coast of Block Island, RI. Similarly, companies like Worley, through their consulting practice Advisian,[5] also work in this initial step as consultants specializing in offshore wind development. Their deep knowledge and experience has been applied to port development and modification, marine mammals, offshore and costal regulations, fish and fisheries, and stakeholder and community engagement. They also evaluate windfarm design feasibility considering technical and economic factors, with a specific focus on HVAC/HVDC, onshore and offshore substations, and green hydrogen.

Collaborations like the one between Burns & McDonnell[6] and Bay Ltd. are a good example of the benefit from leveraging the combinations of extensive practical experience. In Burns and McDonnell's experience, although the U.S. market does not have an extensive resume of offshore substations, it can boast of both offshore structures and onshore substa-

[3] Jones Walker Law Firm, for further information see Appendix A
[4] T. Baker Smith, LLC, for further information see Appendix A
[5] Worley & Advisian, for further information see Appendix A
[6] Burns & McDonnell, for further information see Appendix A

Regional Supply Chain Capabilities (cont.)

tion capabilities. Keystone Engineering Inc.[7] is a U.S. based engineering design consultancy with more than 30 years of experience designing offshore structures for the U.S. energy industry. Keystone is instrumental in planning, but also has capabilities to support other areas of development such as manufacturing and construction. Keystone was also part of the team that built Block Island, designing the jacket foundations used to support the wind farm's turbines.

Jacket foundations for the Block Island Wind Farm, designed by Keystone Engineering. Credit: Keystone Engineering

OSI Renewables[8] supports the planning phase of a project through their experience in designing fixed and floating substructures, as well as lighting and mooring systems. This company is dedicated to the development of a multi-source energy mix that will be essential for the Gulf, and the world's growing energy demands.

MANUFACTURING

Offshore wind manufacturing requires an emphasis on quality paired with an optimization of the manufacturing process itself. When everything is operating properly, the manufacturing process is a main driver of cost reductions for offshore wind power. There are many synergies between manufacturing for the offshore hydrocarbon sector and manufacturing for offshore wind, however it's important to note the key difference is one of serialization versus customization. Offshore wind components must be serial manufactured at a large scale, while manufacturing for offshore drilling rigs (and its supporting infrastructure) has historically been more customized for the project at hand. By leveraging the ingenuity held by the many companies in the Gulf and pairing it with the mass-production model required for offshore wind, this new market may unlock the keys to two central challenges: how to efficiently produce power in an environment with lower-than-average wind speeds and how best to withstand seasonal hurricane activity.

The Gulf is home to companies with a broad range of manufacturing experience. Kiewit Offshore Services[9] has already made a significant contribution to the U.S. offshore wind industry, delivering the first domestically manufactured offshore substation to the South Fork project this summer (2023). Their factory in Ingleside, TX has been in operation since 2000, providing solutions for both onshore and offshore challenges.

LM Wind Power[10] is the largest wind turbine blade manufacturer globally and is considered a "Service Center of Excellence" in New Orleans. Over the last decade, dozens of engineers have been hired who have been involved in the design and testing of several wind turbine blades. This team is also involved in supporting field technicians in carrying out modifications and upgrades and evaluating performance.

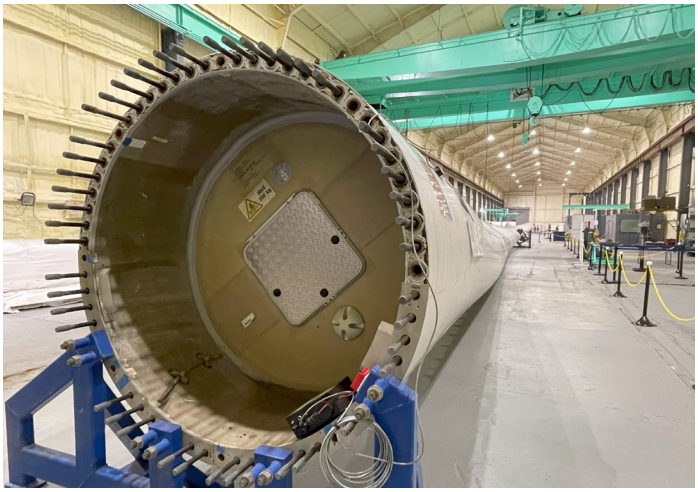
Port facilities such as Avondale Global Gateway[11] are in a strong position to become one of the first offshore wind hubs on the Gulf Coast, capable of barging components up and down the Mississippi River, and have partnered with Union Pacific to transport wind components by rail. This activity will greatly support an increase in supply chain efficiency.

One of the most innovative companies that is quickly rising to prominence for offshore wind manufacturing is Gulf Wind Technology (GWT).[12] By directly addressing the question of how best to design a turbine to harvest wind power in lower wind speed environments, GWT is positioning themselves to solve one of the key challenges for the Gulf of Mexico. Already, GWT has designed, and is in the process of demonstrat-

[7] Keystone Engineering, for futher information see Appendix A
[8] OSI Renewables, for further information see Appendix A
[9] Kiewit Offshore Services, for further information see Appendix A
[10] LM Wind Power, for further information see Appendix A
[11] Avondale Global Gateway, for further information see Appendix A
[12] Gulf Wind Technology, for further information see Appendix A

Regional Supply Chain Capabilities (cont.)

ing, a suite of technologies that can improve turbine yield and performance. This investment has been met with strong interest from project developers, with Shell having recently announced a $10 million partnership to create a Technology Accelerator program with GWT.



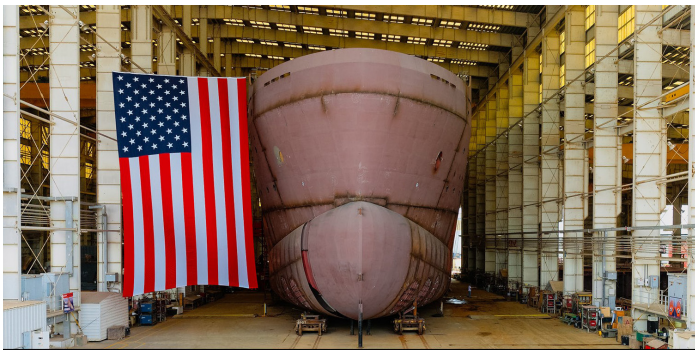
The GWT Accelerator facility is leveraging the heavy industrial capability of the historic Avondale Shipyard to develop and test full-scale rotor blade technology for application in the Gulf of Mexico. Credit: Gulf Wind Technology

CONSTRUCTION AND INSTALLATION

Once all necessary components have been manufactured, construction and installation can begin. This logistically challenging process requires ample port infrastructure, dozens of specialized vessels, and extensive planning and coordination. While this phase is conceptually similar to the offshore construction process for oil and gas platforms, it's important to keep in mind that the project-specific requirements are often very stringent. The load-bearing capacity requirements for port infrastructure is significantly higher than that of offshore oil and gas, the space required in ports and air draft restrictions are more onerous as well. The vessels themselves also have industry-specific requirements, ranging from the latest technology to the heaviest cranes. However, the pre-existing infrastructure for ports and vessels in the Gulf is unparalleled within the United States, providing for an exceptionally good starting point for all these upgrades.

Greater Lafourche Port Commission and Port Fourchon[13] are taking proactive steps to welcome offshore wind development to their energy portfolio. They are committed to collaboration to design and build new infrastructure that will most effectively meet the needs of large-scale operators in the Gulf of Mexico and beyond. This port will be influential in offshore wind development and will also play a large role in operations as well.

Edison Chouest Offshore Wind Companies[14] is a diverse and dynamic marine transportation solution provider, operating a fleet of almost 300 vessels up to 525 feet in length, and the largest provider of U.S. Jones Act compliant offshore marine vessels. Notably, ECO entered the offshore wind market with the Eco Edison, the first-ever American flagged SOV for Ørsted, with a second SOV following soon after to service Beacon Wind. Edison Chouest will also be a key player during the operations and maintenance phase of a project, thanks to their ability to provide sustained logistical support at sea, experience that they gained in the offshore oil and gas sector.



Edison Chouest's Service Operation Vessel (SOV) under construction. Credit: Edison Chouest Offshore Companies

[13] Greater Lafourche Port Commission, for further information see Appendix A

[14] Edison Chouest Offshore Wind Companies, for further information see Appendix A

Regional Supply Chain Capabilities (cont.)

Large manufacturing companies such as Marmon Industrial Energy & Infrastructure[15] have also been working with operators and engineering firms in the offshore wind industry to drive domestic standards in their OSS and Offshore Wind Turbine specifications. Deep South Crane & Rigging[16] maintains a comprehensive fleet of equipment such as cranes and barges, making them able to contribute to the construction of offshore services. Manson Construction[17] also is involved in providing equipment for the industry as a leader in the execution of heavy civil marine, dredging, and offshore contracts, with their Gulf of Mexico operations being centered in Houma, LA.

OPERATIONS AND MAINTENANCE

Once a wind farm is up and spinning, the project shifts into the operations and maintenance phase. This lasts the lifetime of the project (25+ years) and is critical to maintaining a steady power supply to the grid. The Gulf region has a long history of providing reliable service for the offshore oil and gas sector, experience that translates well to offshore wind. While some of the vessel requirements are specific to wind, and cabling maintenance requires different handling as compared to a pipeline, the basic functions remain the same. Some amount of remote monitoring can be done, but regular visits from experienced wind technicians will be necessary to maintain a high standard of operation for the wind farm. This sustained servicing will extend the lifetime of the project and ensure that electricity can flow freely onto the grid.

Greater Lafourche Port Commission is well positioned to support operations thanks to their excellent location, access to the Gulf, and infrastructure (both current and planned), as a one-of-a-kind port in the region. Crowley Wind Services[18] has recently signed an agreement with Port Fourchon to initiate a 42-acre lease with the Greater Lafourche Port Commission. They will work together in developing the first offshore wind port facility in the Gulf of Mexico while advancing the country's clean energy goals.

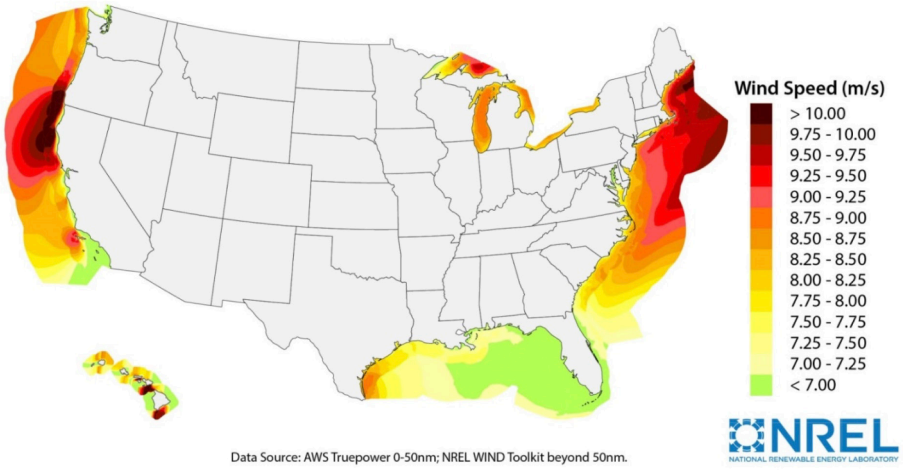
[15] Marmon Industrial Energy & Infrastructure, for further information see Appendix A
[16] Deep South Crane & Rigging, for further information see Appendix A
[17] Manson Construction, for further information see Appendix A
[18] Crowley Wind Services, for further information see Appendix A

Challenges to Market Development in the Gulf

While the Gulf region's unique supply chain capabilities present an exciting path to development, some significant challenges remain. Specifically, the region experiences lower-than-average wind speeds when compared to the East Coast, and the market for offshore wind power is still at an early stage of development. Taken together, these factors will likely lead to somewhat lower auction prices than what has previously been seen, but with each challenge comes a unique opportunity for innovative solutions.

Lower auction prices could mean that project developers will have more room to maneuver, coming up with inventive deployment and offtake strategies. These tactics in turn have the potential to be applied elsewhere, driving the entire industry forward to new frontiers.

As compared to the rapidly maturing East Coast market, average wind speeds in the Gulf of Mexico tend to be lower[19] (see NREL map above), punctuated by seasonal hurricane activity. These conditions will drive turbine designers to test and improve designs, refining their product to advance the industry. The knowledge developed throughout this process will benefit not just the Gulf or America as a whole, but the entire global offshore wind market. Many areas around the world face similar challenges with lower-than-average wind speeds and seasonal storm activity, meaning that the solutions unlocked in the Gulf may become major export opportunities for local expertise and manufactured products.



As this paper has shown, the supply chain potential for the Gulf is clear. However, for offshore wind to become a reality in the region, a reliable form of offtake for the power must be established. On the East Coast, this has been achieved through legislative or executive mandates for the procurement of offshore wind power, either through power purchase agreements (PPAs) or offshore renewable energy credits (ORECs). Details on how these models work are thoroughly explained in NREL's 2020 publication, *Comparing Offshore Wind Energy Procurement and Project Revenue Sources Across U.S. States.*

Currently, Louisiana is leading offshore wind development in the Gulf of Mexico. Governor John Bel-Edwards' task force set a goal of 5 GW of offshore wind[20] and is currently developing a process for state waters leasing.[21] These concrete actions have boosted supplier confidence in the state and drawn in potential project developers, as evidenced by Vestas' recent announcement of a bid for the right to develop offshore wind in the state waters of Louisiana.[22] However, a clear path to market for offshore wind power remains to be established in the state's Public Service Commission process.[23]

Texas presents a more complicated picture, due to its fully de-regulated power market that does not allow for a more typical offshore wind procurement process (such as the PPA or OREC model). Furthermore, recent legislative actions have dampened confidence for

[19] https://www.nrel.gov/docs/fy16osti/66599.pdf
[20] https://www.offshorewind.biz/2022/02/03/louisiana-sets-5-gw-offshore-wind-target-in-its-first-ever-climate-action-plan/
[21] https://gov.louisiana.gov/index.cfm/newsroom/detail/4187
[22] Ibid.
[23] https://www.c2es.org/document/securing-louisianas-role-in-the-offshore-wind-industry/

renewable energy in the state.[24] Despite these headwinds, Texas is a national leader in renewable energy deployment for both land-based wind and solar, and the state could still develop into a strong opportunity for offshore wind. Specifically, offshore wind presents an opportunity to deliver power into the Greater Houston area from the coast, avoiding the transmission congestion issues that are currently facing the state.

Considering these factors, both states may present an opportunity for project developers to pursue a blended offtake model, whereby power flows to multiple users in addition to grid interconnection. The primary driver behind this model is the region's strong demand for hydrogen in heavy industries along the coast.

Currently, 95 percent of commercial hydrogen[25] is produced via steam-methane reforming, a process that generates carbon dioxide as a byproduct. These facilities tend to be located along the Texas and Louisiana coast, supplying petrochemical and ammonia manufacturing. Hydrogen production from electrolysis is a technology that has been around for more than 100 years, but until today has not been cost-competitive. That market dynamic is changing primarily due to policy, but also thanks to advances in new electrolysis technologies.

In June of 2023, the U.S. Department of Energy released its Hydrogen Roadmap, which details growth strategies for the emerging carbon-neutral hydrogen economy. The Roadmap makes a compelling case that the quickest path to market for carbon-free hydrogen production will be to supply pre-existing hydrogen demand, as soon as the technology is cost-competitive. Also detailed in the report is the need for electrolyzers located nearby demand, due to midstream transportation challenges.[26] Given the major demand for hydrogen along the Texas and Louisiana coast for ammonia production and petrochemical activities, this region is perfectly positioned to be a hub for green hydrogen production.

A critical driver in this transition will be the lucrative Production Tax Credit (PTC) for hydrogen production included in the IRA. The PTC is available at a rate of $3/kg of hydrogen that is produced at a carbon intensity level below .45kg of CO2 per kg of hydrogen. This valuable credit allows green hydrogen to be market-competitive for applications such as ammonia production and petrochemical activities.

A key step in launching the new green hydrogen economy will be the Treasury Department's establishment of rules around carbon accounting for grid-connected electrolyzers. For an electrolysis facility that has entered into an agreement with a renewable electricity generator, there are three main considerations to determine whether an electrolyzer ought to qualify for the $3 PTC.

1. **Time-matching:** essentially, is the generator producing the same amount of electricity over a set period of time as is being consumed by the electrolyzer?
2. **Additionality:** assurance that the electricity generation being attributed to the electrolyzer is not pulling clean electricity supply away from previously-existing demand, causing grid operators to backfill the unmet demand with carbon-emitting resources.
3. **Deliverability:** whether sufficient transmission capacity exists in the grid to ensure the delivery of electricity from the generation facility to the electrolyzer.

[24] https://www.texastribune.org/2023/05/25/texas-energy-renewables-natural-gas-grid-politics/
[25] https://www.energy.gov/eere/fuelcells/hydrogen-production-natural-gas-reforming
[26] https://www.hydrogen.energy.gov/pdfs/us-national-clean-hydrogen-strategy-roadmap.pdf

Challenges to Market Development in the Gulf (cont.)

When considering offshore wind in the Gulf of Mexico and its potential to power hydrogen electrolysis, the definition of deliverability will play an important role in determining market viability.

Deliverability is typically thought of as the geographic boundaries within which an electroyzer must purchase its power (e.g. the same grid, the same grid operation authority, or the same interconnection node zone). However, this does not account for the fact that actual deliverability can vary greatly for each of those physical boundary definitions, and major transmission congestion can occur within balancing authorities.[27] Just this summer, Electric Reliability Council of Texas (ERCOT) experienced major transmission congestion issues that are causing spiking electricity prices in major metropolitan areas in Texas.[28]

Rather than geographic boundaries, Treasury may choose to consider a market-based definition of deliverability such as Locational Marginal Pricing (LMP) (see definition at right). In theory, if sufficient transmission infrastructure exists between the generator and the electrolyzer, prices should not vary substantially. A key to a market-based definition will be establishing over what time frame the relative prices would be analyzed, and within what boundary the variation ought to fall (e.g., average annual LMP at the electrolyzer must be within XX percent of average annual LMP at the generation facility). However, it is critical that such a definition not be complicated to the point that it forestalls the buildout of a low-carbon hydrogen economy. Additionally, LMP may not be the best metric for a market-based definition of deliverability. It works well for wholesale energy markets, where prices are public, but would pose a challenge to implementation in fully-regulated electricity markets.

The purpose of a market-based definition would be to avoid a multitude of problems that geographically-based deliverability could induce. For one, intra-authority congestion issues are already well-documented, as has been observed in the pricing surges during extreme weather events within Texas. Given the fact that 90 percent of dedicated hydrogen pipelines in the U.S are in Texas and Louisiana,[30] policymakers ought to encourage the rapid buildout of electrolyzers along this coast. This strategic siting will help alleviate midstream transportation challenges during the initial phases of development of this industry. However, across the large geographic region that stretches from Brownsville, Texas up to Laredo, through Houston, and across to Louisiana, there is only 8,329 MW of land-based wind capacity[31] and 11,298MW of solar.[32] While substantial, this pales in comparison to Texas' total renewable capacity of 48,491 MW of wind and 42,567 MW of solar.[33]

A definition for deliverability that is based on market conditions would incentivize the further buildout of renewable generation along the coast, boosting solar and land-based wind within the greater coastal region while also recognizing offshore wind's ability to increase generation capacity without further exacerbating pre-existing transmission issues; that may be relatively more expensive than simply deploying offshore wind to upgrade. Additionally, this framework for deliverability would incentivize policymakers to invest in transmission infrastructure to connect hydrogen demand centers with renewable generation supply centers.

LOCATIONAL MARGINAL PRICING (LMP)

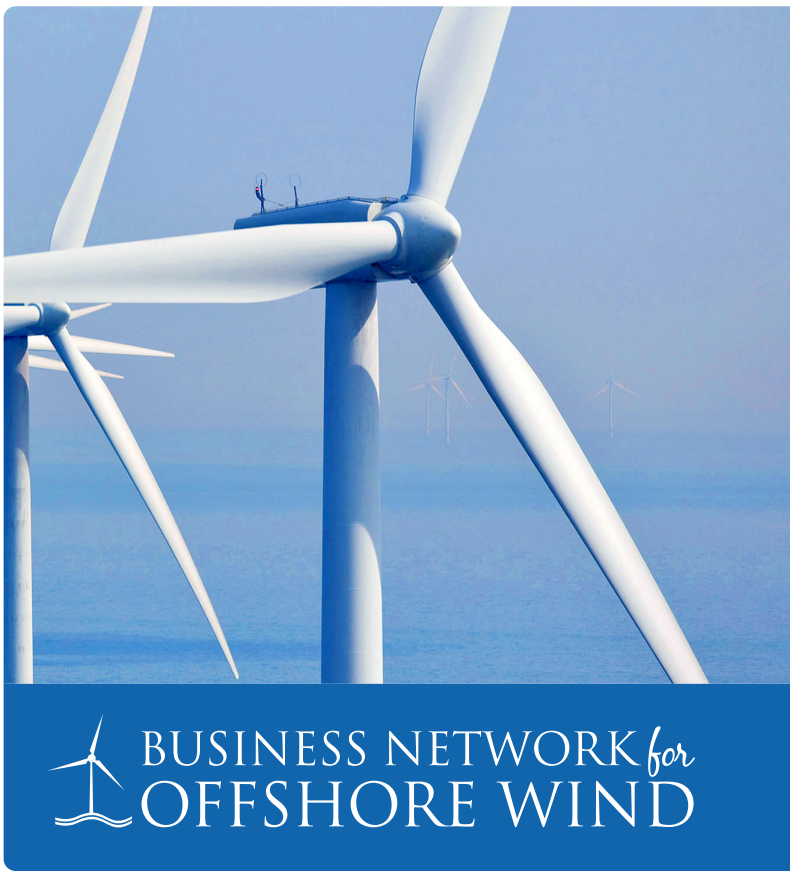
Locational Marginal Price (LMP) is defined as the marginal price for energy at the location where the energy is delivered or received and is based on forecasted system conditions and the latest approved real-time security constrained economic dispatch program solution. LMP is expressed in dollars per megawatt-hour ($/MWh). LMP is a pricing approach that addresses Transmission System congestion and loss costs, as well as energy costs. Therefore, each spot market energy customer pays an energy price that includes the full marginal cost of delivering an increment of energy to the purchaser's location.[29]

[27] https://energyfreedomco.org/elec-system.php
[28] https://insideclimatenews.org/news/10072023/texas-power-grid-transmission-lines-renewable-energy/
[29] https://www.pjm.com/-/media/committees-groups/committees/mic/2020/20201007/20201007-item-07b-manual-11-revisions-redlines.ashx
[30] https://efifoundation.org/insights/hydrogen-isnt-new-at-least-not-in-the-gulf-coast/
[31] https://eerscmap.usgs.gov/uswtdb/viewer/#6.6/28.171/-96.028
[32] https://txrenewables.net/map
[33] Ibid.

Conclusion

With its exceptionally strong workforce, experienced businesses, well-built infrastructure, and history of creative innovation, the Gulf of Mexico is ready for offshore wind. Firms with deep knowledge of environmental data collection and project planning promise to improve upon the permitting process. Its manufacturing sector is poised to lower the cost of production, and with further innovations potentially able to solve the challenge of efficiently harvesting power from lower wind speed environments. Its offshore construction sector will apply the lessons learned from decades of experience to this rapidly evolving industry. All of this hinges on policymakers establishing a clear path to market for offshore wind power, both through traditional means of grid interconnection and enabling creative methods of blended offtake.

The emerging opportunities for offshore wind in the Gulf of Mexico stand to revitalize communities, provide long-term stable jobs, and boost manufacturing for the region. Businesses have already stepped up to lead the way, taking risks on new vessel construction, new manufacturing facilities, and eventually the acquisition of new lease areas. Policymakers owe it to these stakeholders to ensure that a framework for power offtake allows for an unlocking of the full potential of energy development in the Gulf of Mexico and sets this industry on a path to flourishing for decades to come.



THE BUSINESS NETWORK FOR OFFSHORE WIND
offshorewindus.org
Business Network for Offshore Wind
@offshorewindus

APPENDIX A
Further Information on Gulf of Mexico Supply Chain Companies

JONES WALKER LAW FIRM

Drawing upon its experience in the renewables, oil and gas, power, and maritime industries, Jones Walker's offshore wind team provides full-spectrum legal counsel on all aspects of offshore wind project development, including corporate, permitting, construction, transactional, environmental, and maritime issues. Our team capitalizes upon proficiencies from across multiple practices and specialties to effectively meet the challenges of this constantly evolving landscape. Jones Walker attorneys have been actively involved in the US offshore wind market for over a decade, and we continue to be leaders in this sector with respect to East Coast, West Coast, and Gulf of Mexico developments.

Jones Walker has been advising industry participants in the Gulf of Mexico, including providing advices for the potential owner of a Jones Act-qualified wind turbine installation vessel and multiple owners of new US flag CTVs. On the developer side, a cross-disciplinary team of Jones Walker attorneys is on the forefront of offshore wind development in the Gulf of Mexico, advising an offshore wind developer in all aspects of project development, including the negotiation of an operating agreement with the state of Louisiana, to develop potential commercial scale wind farms in Louisiana state waters. The project development advices include issues surrounding permitting with state and federal regulatory bodies, stakeholder engagement, transmission, grid connection, alternative offtake solutions for hydrogen or ammonia, and power purchase agreements.

WORLEY & ADVISIAN

Worley's pursuit of developing offshore wind is founded on our company's purpose of delivering a more sustainable world. Our Advisian consultants provide environmental, geotechnical, and port development services while leading the industry with subject matter experts in critical issues relating to offshore wind development. Some of these areas of expertise include port development and modification, marine mammals, offshore and coastal regulations, fish and fisheries, as well as consultation and engagement with stakeholders and communities. Our teams also evaluate wind farm design feasibility considering both technical and economic factors with a specific focus on HVAC/HVDC, onshore and offshore substations, and production of alternative development cases with Green Hydrogen. Our engineers then develop those concepts into detailed designs and lead the engineering, procurement, construction, and commissioning of the wind farm.

We have been a part of offshore wind projects across the globe, and are currently working on fascinating projects

in North America. A sample of the exiting projects that we are working on include: Buyer's Engineer for the Offshore Wind Renewable Energy Credit Program for New York State Energy Research and Development Authority (NYSERDA), a Great Lakes wind feasibility study, a study to model distribution of predators in the New York Bight, and a project with the National Offshore Wind Research and Development Consortium (NOWRDC) that addresses key challenges of offshore wind farms related to wildlife monitoring and conflict mitigation.

APPENDIX A (CONT.)
Further Information on Gulf of Mexico Supply Chain Companies

T. BAKER SMITH, LLC

T. Baker Smith is a professional services consulting firm headquartered in Louisiana but also with offices in Texas and Mississippi. We provide professional engineering, environmental, surveying, and innovative solutions to our clients and the communities we serve and have been for 110 years. This is an electrifying time for the Gulf Coast and T. Baker Smith shares this excitement. The development of offshore wind power production, and the shore-based support through local ports, businesses, and communities, will continue to lift these areas to greater economic prosperity, while also displaying the one-of-a-kind cultural and environmental landscape.

Our work with regional power providers on their transmission and distribution systems, local ports and local governments, and experience in the marine and coastal environments, provide T. Baker Smith a distinct opportunity to provide service to the offshore wind firms directly, but also the organizations supporting these projects. Our ability to combine environmental resource review, project planning and design, offshore data collection, and ownership of our own boats and equipment, with our regulatory agency relationships and local project experience, uniquely positions us for these projects. We possess the environmental, survey, and engineering experience to support clients as we all look forward to their development. We worked on the initial offshore wind development in Block Island, Rhode Island, and we look forward to serving clients and communities in these new endeavors. T. Baker Smith is committed to the Gulf Coast, its people, and its environment.

BURNS & MCDONNELL

Burns & McDonnell is a family of companies bringing together an unmatched team of more than 13,500 engineers, construction and craft professionals, architects, planners, technologists, and scientists to design and build our critical infrastructure. With an integrated construction and design mindset and a passion for developing offshore wind in the United States, Burns & McDonnell has been involved with approximately three quarters of the country's commercial offshore wind projects. Our U.S. offshore wind experience scopes include design of onshore substations, onshore underground and overhead transmission, permitting support and more.

To help the U.S. reach its offshore wind generation targets and address global supply chain challenges for the industry, Burns & McDonnell and Bay Ltd. have teamed to provide U.S.-based engineering, procurement, fabrication and construction of offshore substations. While engineering will be led from Burns & McDonnell offices in the Northeast the fabrication and construction is set to take place in existing Bay Ltd. facilities in Corpus Christi, Texas. Leveraging the combinations of extensive practical experience of both companies can boast of both onshore substation capabilities and offshore substation structures.

KEYSTONE ENGINEERING

Keystone Engineering is a U.S. based engineering design consultancy with more than 30 years of experience designing offshore structures for the U.S. offshore energy industries. Earning a global reputation in the offshore wind industry, Keystone designed the substructures for Block Island Wind Farm- the first offshore wind farm to be certified, fully permitted, installed, and commissioned in U.S. waters.

Keystone has been involved in nearly every facet of the offshore energy supply chain and has detailed knowledge of US fabrication yards, equipment suppliers, and the fleet of transportation and installation vessels.

Our extensive experience with U.S. regulations, CVA interface, procurement, and installation of offshore wind structures along with our relationships with reputable fabricators and installation contractors, provide a key advantage in the development, pre-FEED, detailed design, and construction support stages of offshore windfarms by focusing on constructability, efficiency, and reducing CAPEX and OPEX. Keystone provides engineering services throughout the entire lifecycle of offshore wind projects, for support structures of wind turbine generators (WTG) and offshore substations (OSS)."

OSI RENEWABLES

Leveraging nearly 80 years of experience with fixed and floating structures as well as lifting and mooring systems for the traditional energy industry, Oil States' OSIRenewables™ group is Connecting the Energy Future™ by supporting the development of a multi-source energy mix that supports the world's growing energy demands.

Whether looking for cost-effective fixed platform foundation or floating wind platform system, custom lifting equipment to optimize construction feeder vessel operations, platform-based lifting solutions, or a trustworthy offshore service partner, we apply our experience as a leading specialist in offshore energy construction to deliver reliable, cost-effective solutions for wind & marine energy.

OSIRenewables' patent-pending FTLP™ floating wind platform is scalable to 20+ MW, capable of water depths up to 150 meters and wave heights averaging up to 10 meters, which significantly expands beyond what is currently possible with other floating platform options – and it has a lower CO_2 footprint. The modular design enables local manufacturing and reduces the quayside footprint required. OSI is one of the few, if not the only, supplier globally that offers wind solutions for shallow water fixed bottom, mid-water, and deepwater scenarios with reliable components and turnkey floating systems.

Powered by Oil States' rich legacy, OSIRenewables is advancing the next generation of offshore wind. We look forward to discussing your project needs.

APPENDIX A (CONT.)
Further Information on Gulf of Mexico Supply Chain Companies

LM WIND POWER

GE Vernonva is committed to the energy transition in the US as one of the top 5 wind turbine OEM's and owner of LM Wind Power, the largest wind turbine blade manufacturer globally. LM Wind Power is considered a "Service Center of Excellence" in New Orleans, the site employing 25 LM Wind Power employees, mostly blade and composite engineers. Over the last decade, GE and LM Wind Power have hired and trained dozens of engineers who have been involved in the design and testing of several wind turbine blades.

This wealth of knowledge on new technology development have prepared the site for its next phase, focused on technology application and ensuring that wind turbines operate reliably for more than 20 years. The current team is focused on developing services solutions for productivity improvements, training technicians for the application of these new solutions, developing a world class service engineering team to support field technicians or carry out modifications and upgrades, support GE Renewable Energy with RCAs whenever there is an issue with a LM Wind power blade, and lastly remote monitoring and performance evaluation of LM blades.

AVONDALE GLOBAL GATEWAY

Avondale Global Gateway can become the first offshore wind hub on the Gulf Coast and support other renewable sectors. The site is capable of barging components up and down the river and have a partnership with the Union Pacific to transport wind components by rail. AGG already transports many of the same construction materials needed for the renewable energy industry. By combining the multimodal commerce channels with onsite manufacturing, companies have an opportunity to increase supply chain efficiencies.

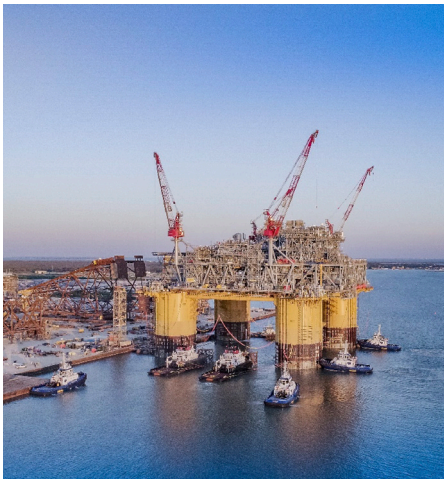
From its inception, AGG has handled onshore wind components for the U.S. market, including nacelles, hubs, powertrains and blades, and is a competitive site to become the Gulf Coast's first offshore wind hub. Unlike other terminals, with AGG's vast space, these parts can initially be imported and stored on site for sub-assembly and ultimately manufacturing onsite to then be transported by barge to ports like Port Fourchon for deployment. Avondale Global Gateway is foundational to Louisiana attracting these developers, manufacturers and suppliers so that Louisiana can realize its maximum job and economic potential for offshore wind.

KIEWIT OFFSHORE SERVICES

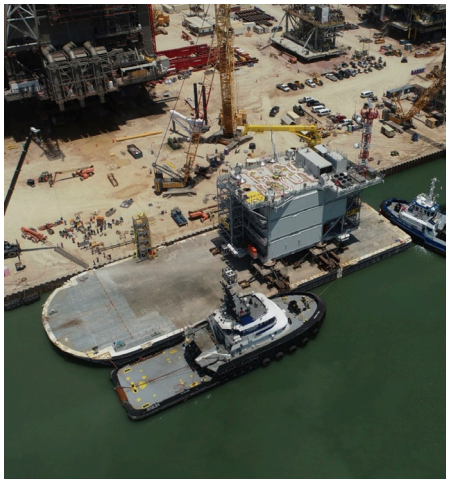
Kiewit Offshore Services (KOS) is proud to have supported the offshore energy sector delivering projects both domestically and internationally. Our facility in Ingleside, has been in continuous operation since 2000 and services not just the offshore energy needs of our customers but has delivered many complex processes and piperack modules to onshore locations. In addition to energy markets KOS has supported our customers and projects across multiple market segments from civil infrastructure developments such as bascule bridges to the space launch industry and most recently the emerging U.S Offshore wind market.

This broad diversity of capabilities has enabled KOS to be a consistent employer and proud corporate citizen in the greater Corpus Christi area. While the type of projects we execute may change over time our core values of People, Integrity, Excellence, and Stewardship will continue to guide our company into the future.

Kiewit Offshore Services aerial overview



Offshore production platform for Gulf of Mexico



Offshore wind substation platform

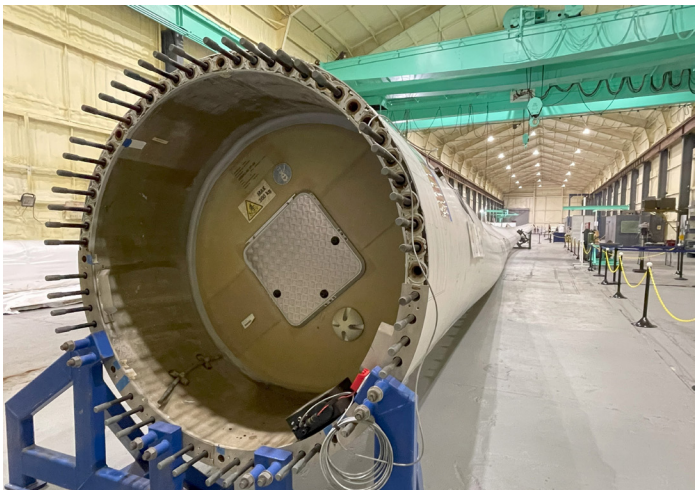
APPENDIX A (CONT.)
Further Information on Gulf of Mexico Supply Chain Companies

GULF WIND TECHNOLOGY

Gulf Wind Technology (GWT) is a Louisiana-based company uniquely positioned to demystify wind turbine technology for both onshore and offshore assets. Decisions made during the development stages of a project, including the technology selection, blade design and deployment process contribute directly to upfront capital expense and contribute directly to the operating costs for maintaining the turbine assets. The team at GWT have decades of experience designing, building, and testing blades and rotor technology for turbines deployed across the globe. This experience is leveraged to address the information asymmetry that exists between operators of wind turbines and the manufacturers that supply the equipment, helping to foster greater collaboration within the industry.

Gulf Wind Technology has curated, and is in the process of demonstrating, a suite of technologies that can improve turbine yield and performance – reducing project-level capital and operating expenses. Through the Gulf Wind Technology Accelerator, a strategic program partnership with Shell New Energy Ventures, GWT is developing technology and workforce solutions to directly address the competing challenges of fielding large rotors in an offshore environment subject to hurricane conditions. The innovation at GWT, however, doesn't end in the waters of the Gulf. GWT additionally supports onshore owners and operators in solving complex problems that go beyond the scope of industry standard repairs. The solutions GWT provides are innovative, driven by the customers business case, and are rigorously trialed and tested to ensure results are to specification during every installation.

The heart of GWT's operations is a state of the art 30,000 sq. ft Technology Accelerator Facility located in the historic Avondale Shipyards – a recently renovated shipyard into a terminal logistics and manufacturing hub. The facility has been outfitted with the latest in aerodynamic, composite manufacturing and testing equipment, leveraging innovative approaches from industries like Formula-One to rapidly prototype and trial new concepts. Twin 25-ton cranes span a building that is over 400 ft (120 m) long, allowing the team to develop and test technology at the scale of the largest



blades in the industry today. This facility also serves as the backbone for the development of local skills and talent in the offshore wind rotor space. GWT is engaging with future engineers, designers, and composite specialists through a strategic partnership with Jefferson Parish Schools and in helping shape and advise the wind energy program curriculum with Delgado Community College. GWT also works directly with numerous universities in the Gulf South, including University of New Orleans, LSU & Tulane. The Accelerator houses several training platforms, both hands-on and virtual reality, helping to visualize both the challenges and solutions for offshore wind in the Gulf.

The future of offshore wind will require the rigorous application of proven innovation technology, collaboration, and partnerships, and GWT is uniquely positioned to help lead the industry in the realization of the renewable energy potential in the Gulf.

MARMON INDUSTRIAL ENERGY AND INFRASTRUCTURE

Large manufacturing companies such as Marmon Industrial Energy & Infrastructure have been working with operators and engineering firms in the offshore wind industry, to drive domestic standards in their OSS and Offshore Wind Turbine specifications.

While there is not a comprehensive offshore wind standard published to address API, IEC, or IEE cables as the recommended practice, domestic content requirements should be considered when selecting one of these options. All major operators with offshore assets in North America, reference API RP-14F as the leading recommended practice for Fixed and Floating facilities for Unclassified and Classified Hazardous Area Locations. Without a standard in place, API cables are a viable option for offshore wind, due to their experience in the Gulf, referenced as a minimum industry practice during the BP Deep Water Horizon trials, and to fulfil the 20 percent domestic content requirement as outlined by the BOEM leasing stipulations.

It is important to note, sourcing US manufactured goods and labor will bolster the economy, lower offshore maintenance and repair costs, secure reliable power to shore, with equipment designed to exceed the life expectancy of all offshore wind facilities.

DEEP SOUTH CRANE & RIGGING

For more than 50 years, Deep South has gone above and beyond to provide the right tools and the right talent for our heavy lift and transport customers. We maintain a comprehensive fleet of equipment: cranes to 3,000 tons, the proprietary VersaCraneTM fleet, hundreds of specialty transporters, bridging and barging solutions, custom RORO facilities, heavy rigging, jack and slide systems, gantries, steel mats, and other custom tools. We complete projects in civil, commercial, heavy industrial, oil and gas exploration and production, petrochemical, power generation, and pulp and paper.

Ranked among the top crane companies in the country and world by American Cranes & Transport and International Cranes & Transport, we are still a family-owned company with over a 50-year history of true innovation, a hardworking spirit, highly personalized services, and a commitment to safety above all else. Experience what lifts Deep South above the rest.

APPENDIX A (CONT.)
Further Information on Gulf of Mexico Supply Chain Companies

MANSON CONSTRUCTION

Established in 1905, Manson Construction Co. is a leader in the execution of heavy civil marine, dredging, and offshore contracts. Manson is ranked as the #2 Marine and Port Facility contractor in the United States, according to Engineering News Record (ENR). Our technologically advanced fleet is one of the nation's largest and is maintained by our in-house Equipment Engineering group. With nearly 800 employees nationwide, we offer experienced project management personnel, skilled craft employees, and in-house engineering teams staffed by professionals with expertise in all types of marine work, safety, project management, environmental compliance, and cost forecasting.

Manson's Gulf of Mexico (GOM) operations are centered in Houma, Louisiana, the homeport of the derrick barge EP PAUP (US flagged, 1,000 ton, 156 bunks) and the derrick barge WOTAN (US flagged, 500 ton, 103 bunks). Manson has extensive experience installing and decommissioning jackets and decks on the GOM shelf. With experienced project management, supervision, and crews, Manson has partnered with oil and energy customers in the GOM since 1997 and understands the resource availability, logistics, and nature of offshore work. Manson has recently been actively engaged in offering expertise and local knowledge in the investigation of potential GOM wind projects

Derrick Barge (Manson Construction)

GREATER LAFOURCHE PORT COMMISSION

The Greater Lafourche Port Commission and Port Fourchon are and have been taking proactive steps to welcome offshore wind development to our all of the above energy portfolio.

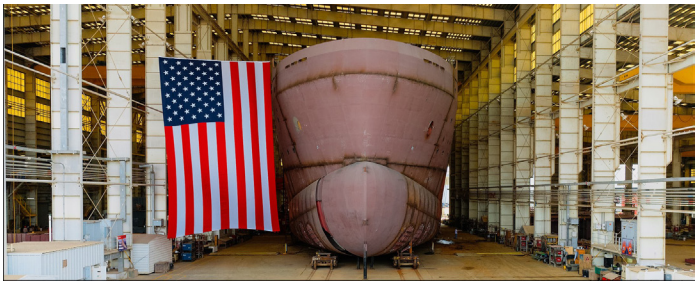
To that end, the Board of Commissioners at the GLPC are committed to working with private interests to design and build facilities and infrastructure in Port Fourchon that will most effectively meet the needs of large-scale operators in the Gulf of Mexico and beyond. That commitment is already drawing interest in the offshore wind energy sector, including plans for a new tenant to develop a purpose-driven offshore wind facility and current port tenants' plans to develop a new multi-purpose heavy industry facility to service wind farm fabrication, assembly, and repair.

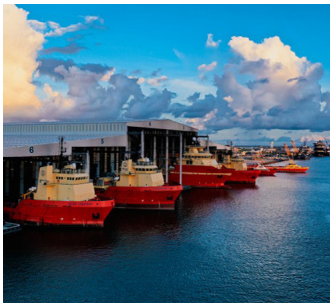
The truth is Port Fourchon's location, access to the Gulf of Mexico, and infrastructure (both current and planned) can't be matched or replicated by any other port in the Gulf South Region of the U.S.

EDISON CHOUEST OFFSHORE WIND COMPANIES

Edison Chouest Offshore (ECO) is recognized today as the most diverse and dynamic marine transportation solution provider in the world. ECO operates a growing fleet of almost 300 vessels up to 525 feet in length and serves an expanding global customer base. ECO is the largest provider of U.S. 'Jones Act' compliant offshore marine vessels, the largest provider of offshore marine service vessels to Central and South American markets, has the largest base of shipyards in the U.S., owns and manages world-class port terminal facilities and operates worldwide on all oceans. Staying on the forefront of new technologies is an integral part of the ECO vision, as evidenced by recent advances in the areas of emissions reductions, subsea support services, integrated bridge systems, remote monitoring of vessel systems and global communications.

ECO entered the offshore wind market with the Eco Edison, the first-ever U.S. flagged 'Jones Act' compliant Service Operations Vessel (SOV) for Ørsted. ECO is engineering, constructing and will operate the Eco Edison as well as a second SOV for Empire Wind, a joint venture between Equinor and BP. The SOVs will be utilized during the operation and maintenance (O&M) phases of wind farm projects, serving as an at sea base of operations. ECO is also playing an integral part in offshore wind operations by repurposing offshore supply vessels to transfer parts and crew to assist in the construction of offshore wind turbines. ECO currently has three walk-to-work vessels, one PSV and one ploughing AHTS operating at South Fork and Vineyard Wind this year. ECO looks forward to the hundreds of jobs these projects are creating for U.S. workers.





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Further Information on Gulf of Mexico Supply Chain Companies

CROWLEY WIND SERVICES

Crowley, a leading maritime, logistics and energy solutions company based in Jacksonville, Florida, has more than 130 years of experience providing ports, maritime and engineering solutions, including in the Gulf of Mexico markets. Through Crowley Wind Services (CWS), the company has begun development and planning for wind services terminals in the U.S., leveraging its land and sea assets, offshore operations expertise, third-party logistics capability, digital platforms and workforce development and training initiatives.

Crowley Wind Services (CWS) is committed to the advancement of the offshore wind industry in the Gulf of Mexico and has recently signed a Right of First Refusal with Port Fourchon to initiate a lease on 42 acres with the Greater Lafourche Parish Port Commission. CWS and Port Fourchon will work towards developing the first offshore wind port facility in the Gulf of Mexico and support the advancement of offshore wind to meet U.S. clean energy goals.