



Quest Floating Wind Energy  
a Quest Offshore Resources company

# 2020 Global Floating Wind Energy Market and Forecast Report 2019 - 2034

**Volume 2**  
**January 2020**

*Brochure of Report Highlights*



# Report Findings

This comprehensive report dedicated to Floating Wind illustrates the growing market opportunities across the supply chain over the next 15 years including the most active developers, potential market size, pertinent project activity details and other vital metrics illustrated by region and construction timeline. Quest projects that more than 17.5 GW of Floating Offshore Wind will be installed worldwide to 2033, a number that will grow exponentially following the addition of newly announced projects.

1. The wind industry continues to deliver value to enhance wind's cost competitiveness and efficiency with steady improvements in the Levelized Cost of Electricity (LCoE). Since 2016, offshore wind particularly has pushed reductions in LCoE in excess of 50%.
2. Offshore globally, there have been more than 1.4 GW of offshore wind auctions planned in 2019 following a strong showing of 3.3 GW in 2018.
3. The European Union is leading projected installed capacity additions in offshore wind (Floating and Bottom-fixed) totaling 92GW at 2030 in the Sustainable Development Scenario growing to 175GW by 2040.
4. Offshore Floating Wind Energy is a robust, fast-moving market. Europe has been the 'test bed' for Floating wind and the success of these projects is driving export of this technology to South Korea and Taiwan now and to the USA well before 2025. The view towards large-scale projects aided with ample financial backing will help to drive efficiencies and lead to significantly reduced costs.
5. Ten potential super-sized Floating offshore wind projects, each ranging between \$2.2 billion and \$10.8 billion in CapEx, represent a sizeable share (over 60%) of the \$63 billion total addressable market presently identified.
6. As illustrated in the report's figures, the near-to-medium term market to 2026 is sizeable representing \$44.6 billion in CapEx comprising projected wind power capacity additions of 11,397 MW to be powered by 1,400 Floating Turbine Units (FTUs).
7. Projects with status Online and Under Development denote 869 cumulative MW led by South Korea (504 MW) then France (107 MW), Norway (93 MW) and the United Kingdom (81.5 MW). Japan, Portugal and Spain round-out the total.
8. Near-to-medium-term projects with statuses Under Development and Planned total \$15.9 billion in CapEx led by Asia/Pacific with \$6.8 billion, USA-Pacific with \$6.2 billion, Northern Europe with \$2.1 billion, and Southern Europe with \$0.7 billion. Over this period, \$6.1 billion will be allocated to turbines, \$3.5 billion to substructures, \$2.5 billion for cabling, \$1.8 billion in moorings, and \$402 million on installation.
9. Larger scale defines the project mix starting with 2020 & 2021 project sanctions (FIDs) and Q FWE forecasts a crescendo of activity from 2024-2026. Regions leading the charge are the USA-Pacific (Castle Wind), Saudi Arabia (Plambeck) and the 4x 20-25 units each projects in South Korea (Donghae I, Donghae TwinWind, Gray Whale and White Heron). These Planned projects represent wind power capacity additions totaling 3,344 MW from 370 FTUs.

## Regional Highlights

10. Projects with status Planned and Possible denote 3,344 and 13,360 cumulative MW, respectively, across the USA-Pacific, Asia/Pacific, Northern Europe, USA-Atlantic and Southern Europe. USA-Pacific and Northern Europe represent 59% of this total while Asia/Pacific denotes 30% and USA- Atlantic and Southern Europe are about 6% and 5%, respectively.
11. The USA, United Kingdom, Taiwan, Japan, South Korea and Spain lead the exponential growth in cumulative total MW for Planned and Possible offshore Floating wind projects to 2033. These countries represent projected wind capacity additions totaling over 16 GW. Other notable contributors include Saudi Arabia, France and Norway.
12. The Asia/Pacific region leads total FTU activity volumes with a 63% share of the projects Under Development representing 65 floaters. As a whole, the Asia/Pacific opportunity sees potentially 815 Floating units by 2033 representing 5.5 GW of installed capacity. Asia Pacific developers and their supply chain, on par with their Northern Europe counter parts, are leading the charge towards improved project economics and more optimized CapEx/MW and ultimately lower LCoE's.
13. The Asia/Pacific is a Definite Bright Spot. Quest sees the near domination of Floating wind presently shining through across the Asia/Pacific with a Total Addressable Market exceeding \$22.9 B CapEx represented by six projects in South Korea, six in Japan, four in Taiwan, and one in Saudi Arabia. Shell (EOLFI) looks to develop four of the six largest projects as measured in CapEx which are located in Taiwan. Acacia joined with designer Ideol is set to develop the largest project in the region to be situated off the western shore of Japan.
14. In the Asia Pacific, Shell (EOLFI), Marubeni and Acacia lead development activities in the region for announced projects totaling 571 FTUs out of 820 across the Asia/Pacific in total. Top designers include Ideol, PPI, Saipem, and Hexicon when measured in number of Floating Turbine Units.

15. Projected CapEx in Northern Europe is led by the United Kingdom with eight projects representing \$13.8 billion in spend and Norway with four presently identified projects totaling \$996 million in CapEx.
16. Off Southern Europe 913 MW of offshore Floating wind projects are presently identified denoting an average of \$5.5 million CapEx per MW, one of the higher unit costs across regions led from the disproportionate mix of both Demonstrator and Pre-Commercial projects (relative to the smaller number of Commercial projects that received Final Investment Decision). These 10 projects exceed \$3.9 billion in CapEx with 39% allocated to turbines, 25% substructure, 9% cabling, 15% mooring system and 3% installation.
17. Nearly six GW of projects comprising 622 FTUs are identified for the USA-Pacific and Atlantic waters averaging \$4.2 million CapEx per MW and representing a total spend of about \$20 billion. The segmentation by supply chain shows turbines at \$8.3 billion (42%), substructure at \$4 billion (20%), cabling \$3 billion (15%), mooring \$2.2 billion (11%) and installation \$518 million (2.6%). The majority of USA-Pacific's offshore Floating wind projects are Commercial scale with the first project stated to be Online in 2023 or 2024.

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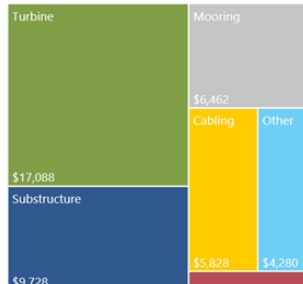
# Sample Charts, Graphs & Tables (Report contains 150 figures in total)



## Seven-Year Comparisons - Under Development, Planned & Possible

CapEx 2020-2026

### Supply Chain Segment



Total Addressable Market (m...)

\$44,566

TotalUnits

1400

LCoE Est (\$/MWh)

\$143.0

TotalMW

11,397

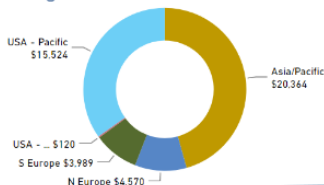
CapexPerUnit (millionUSD)

\$34.0

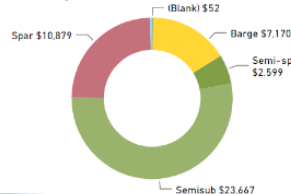
CapexPerMW (millionUSD)

\$5.5

### Region

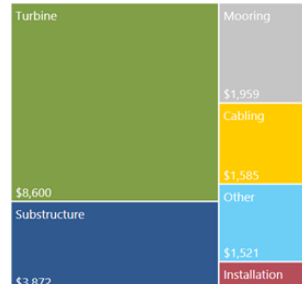


### Hull Shape



CapEx 2027-2033

### Supply Chain Segment



Total Addressable Market (m...)

\$18,105

TotalUnits

683

LCoE Est (\$/MWh)

\$109.4

TotalMW

6,089

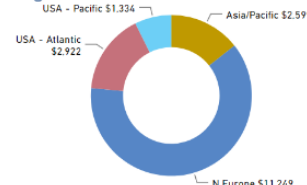
CapexPerUnit (millionUSD)

\$27.8

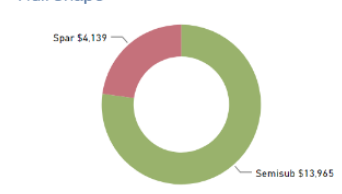
CapexPerMW (millionUSD)

\$3.5

### Region



### Hull Shape



Charts, Tables and Graphs are sourced from our Q Vision Product Suite.

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## Northern Europe Projects in CapEx by Project Name

Under Development, Planned & Possible

ProjectName	Country	Online Year	FixedOrFloat	DevType	Status	LocWd	Total Units	TotalMW*	Substructure	Turbine	Mooring	Cabling	Installation	Other	CapexEst USD	CapexPer UnitUSD	CapexPer MWUSD	Developer	Designer	DesignName	TurbineMfr
Dolphin BEM full scale	UK	2023	Floating	Commercial	Possible	100	420	4000	\$2,327	\$5,540	\$1,094	\$718	\$332	\$874	\$10,826	27.1	2.7	Dolphin	Principle Power (PSR)	WindFloat	MHI Vestas (PSR)
Elicio Ideal Scotpower	UK	2023	Floating	Commercial	Possible	105	35	350	\$415	\$485	\$317	\$85	\$29	\$148	\$1,480	42.3	4.2	Elicio Ideal	Ideal (PSR)	Damping Pool	TBD
Hywind Scotland II	UK	2024	Floating	Commercial	Planned	100	34	204	\$249	\$339	\$107	\$121	\$28	\$94	\$938	27.6	4.6	Equinor	Equinor (Reported)	Hywind II	Siemens Gamesa (PSR)
Bretagne Sud	France	2025	Floating	Commercial	Possible	62	20	240	\$134	\$266	\$102	\$71	\$17	\$62	\$651	32.6	2.7	Shell (EOLFI)	Naval Energies (PSR)	Sea Reed	GE (PSR)
Hywind Tampen	Norway	2022	Floating	Commercial	Under devel	280	11	88	\$141	\$137	\$68	\$134	\$10	\$54	\$444	49.5	6.2	Equinor	Equinor (Reported)	Hywind III	Siemens Gamesa (Reported)
BP Noaka / Aker	Norway	2027	Floating	Commercial	Possible	220	11	110	\$122	\$152	\$52	\$48	\$9	\$39	\$424	38.5	3.8	Aker	Equinor (Reported)	Hywind III	Siemens Gamesa (PSR)
Kincardine Tranche 2	UK	2020	Floating	Commercial	Under devel	70	5	48	\$105	\$151	\$32	\$63	\$10	\$40	\$400	79.9	8.4	KDOWL	Principle Power (Reported)	WindFloat	MHI Vestas (Reported)
Gicon SOF 5-6 MW	Germany	2025	Floating	Pre-Commercial	Possible	35	6	36	\$30	\$60	\$15	\$44	\$5	\$16	\$170	28.3	4.7	Gicon	Gicon (Reported)	Gicon	Siemens Gamesa (Reported)
Grix & Belle-lie	France	2022	Floating	Pre-Commercial	Under devel	62	3	29	\$20	\$39	\$15	\$22	\$2	\$10	\$109	36.4	3.8	Shell (EOLFI)	Naval Energies (Reported)	Sea Reed	MHI Vestas (Reported)
Downreay Tri	UK	2026	Floating	Demonstrator	Possible	85	1	10	\$17	\$15	\$8	\$6	\$1	\$2	\$49	49.2	4.9	Highland Floating Wind	Hexicon (Reported)	Hexicon	TBD
Dolphin BEM full size demo	UK	2026	Floating	Demonstrator	Possible	100	1	10	\$4	\$13	\$4	\$19	\$1	\$2	\$43	42.6	4.5	Dolphin	Principle Power (Reported)	WindFloat	MHI Vestas (Reported)
ARLOWT Hexafloat	Ireland	2022	Floating	Demonstrator	Under devel	87	1	2	\$9	\$4	\$5	\$14	\$1	\$1	\$34	34.4	6.9	EMEC	Saipem (Reported)	Hexafloat	TBD
Dolphin BEM Demonstrator (Hydrogen)	UK	2021	Floating	Demonstrator	Planned	100	1	2	\$4	\$3	\$4	\$19	\$1	\$1	\$32	32.2	16.1	Dolphin	Principle Power (Reported)	WindFloat	MHI Vestas (Reported)
Gicon SOF	Germany	2021	Floating	Demonstrator	Possible	35	1	2	\$6	\$5	\$3	\$4	\$1	\$0	\$20	19.9	8.7	Gicon	Gicon (Reported)	Gicon	Siemens Gamesa (PSR)
TetraSpar Demo	Norway	2020	Floating	Demonstrator	Under devel	150	1	4	\$8	\$7	\$4	\$0	\$1	\$0	\$20	19.9	5.5	Shell (EOLFI)	Stedals (Reported)	TetraSpar	Siemens Gamesa (PSR)
Eolink	France	2021	Floating	Demonstrator	Possible	30	1	6	\$5	\$10	\$3	\$0	\$1	\$0	\$19	19.1	3.2	Eolink	Eolink (Reported)	Eolink Demonstrator	Eolink (Reported)
SeaTwirl S2	Norway	2020	Floating	Demonstrator	Under devel	150	1	1	\$2	\$1	\$2	\$3	\$0	\$0	\$8	8.3	8.3	Seatech	SeaTwirl AB (Reported)	SeaTwirl 2	Seatech/Siemens Gamesa (Reported)
Iberdrola Demonstrators	UK	2022	Floating	Demonstrator	Possible	100	2	10	\$13	\$17	\$20	\$2	\$2	\$0				Iberdrola	TBD	TBD	TBD
<b>Total</b>							<b>535</b>	<b>5150</b>	<b>\$3,613</b>	<b>\$7,243</b>	<b>\$1,776</b>	<b>\$1,392</b>	<b>\$451</b>	<b>\$1,344</b>	<b>\$15,767</b>	<b>34.6</b>	<b>5.8</b>				

Reported = Value Confirmed | PSR = Preferred Supplier Relationship, Project Value

Charts, Tables and Graphs are sourced from our Q Vision Product Suite.

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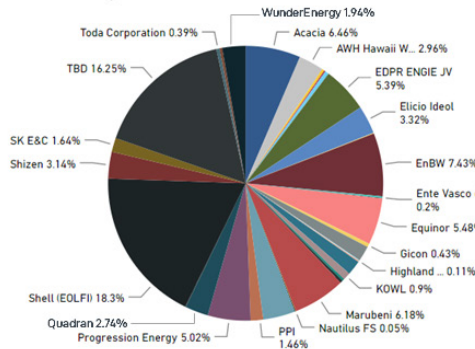
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## Project CapEx by Developer

2020-2026 (million USD)

- Shell (combined with their acquisition of EOLFI) leads the most active developers globally with about 18% of the spend, \$8.2 billion, for those projects scheduled to be Online from 2020 to 2026.
- About 16% of the project spend remains an available opportunity for developers and totals about \$7.25 billion in CapEx.
- The second most active developer is EnBW which has a possible project of 100 units named Castle Wind offshore Morro Bay, California within the USA-Pacific region. It is our understanding that this project has yet to finalize their floater design selection.



Charts, Tables and Graphs are sourced from our Q Vision Product Suite.

Developer	Substructure	Turbine	Mooring	Cabling	Installation	Other	Total
Acacia	\$660	\$798	\$766	\$313	\$66	\$275	\$2,878
AWH Hawaii Wind LLC	\$307	\$553	\$171	\$131	\$35	\$124	\$1,320
Cobra	\$25	\$50	\$24	\$6	\$4	\$12	\$121
Dolphyn	\$9	\$16	\$8	\$37	\$2	\$3	\$75
EDF	\$37	\$77	\$28	\$37	\$6	\$15	\$199
EDPR ENGIE JV	\$558	\$937	\$228	\$380	\$60	\$240	\$2,403
Elicio Ideol	\$415	\$485	\$317	\$85	\$29	\$148	\$1,480
EMEC	\$9	\$4	\$5	\$14	\$1	\$1	\$34
EnBW	\$640	\$1,385	\$339	\$549	\$83	\$316	\$3,312
Ente Vasco de la Energia	\$27	\$33	\$11	\$8	\$3	\$7	\$89
Eolink	\$5	\$10	\$3	\$0	\$1	\$0	\$19
Equinor	\$655	\$859	\$286	\$328	\$70	\$244	\$2,442
Gicon	\$36	\$65	\$19	\$47	\$6	\$17	\$190
GIG (Macquarie)	\$172	\$277	\$123	\$130	\$21	\$80	\$803
Highland Floating Wind	\$17	\$15	\$8	\$6	\$1	\$2	\$49
Iberdrola	\$13	\$17	\$20	\$20	\$2	\$0	\$52
KNOX Equinor	\$172	\$277	\$94	\$124	\$21	\$76	\$764
KOWL	\$105	\$151	\$32	\$63	\$10	\$40	\$400
Magellan	\$33	\$50	\$14	\$12	\$4	\$13	\$127
Maine Aqua Ventus	\$14	\$43	\$13	\$41	\$4	\$6	\$120
Marubeni	\$470	\$1,406	\$361	\$203	\$59	\$256	\$2,755
Nautilus FS	\$7	\$8	\$3	\$2	\$1	\$0	\$21
NEDO	\$12	\$5	\$7	\$10	\$1	\$1	\$37
Plambeck	\$312	\$693	\$213	\$264	\$42	\$161	\$1,685
PPI	\$125	\$208	\$171	\$72	\$12	\$65	\$653
Progression Energy	\$497	\$895	\$214	\$360	\$57	\$214	\$2,236
Quadrant	\$357	\$399	\$170	\$153	\$25	\$117	\$1,220
Saltec Offshore	\$7	\$3	\$6	\$2	\$1	\$0	\$19
Seawind	\$2	\$1	\$2	\$3	\$0	\$0	\$8
Shell (EOLFI)	\$1,803	\$3,120	\$1,278	\$873	\$285	\$796	\$8,156
Shizen	\$338	\$349	\$412	\$131	\$29	\$140	\$1,399
SK E&C	\$150	\$277	\$123	\$94	\$21	\$69	\$733
TBD	\$1,408	\$3,047	\$746	\$1,165	\$183	\$691	\$7,240
Toda Corporation	\$67	\$33	\$31	\$16	\$8	\$17	\$173
US Air Force	\$33	\$35	\$27	\$25	\$2	\$14	\$137
WunderEnergy	\$231	\$509	\$211	\$119	\$26	\$119	\$1,216
<b>Total</b>	<b>\$9,728</b>	<b>\$17,088</b>	<b>\$6,462</b>	<b>\$5,828</b>	<b>\$1,180</b>	<b>\$4,280</b>	<b>\$44,566</b>

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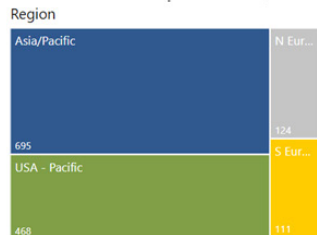
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## Project Activity 2020-2026

Under Development, Planned & Possible

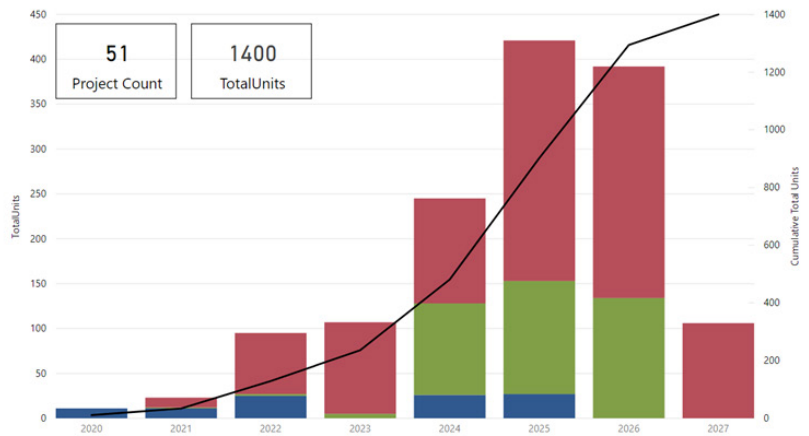


- Offshore Floating wind energy is a fast-moving market. Europe has been the 'test bed' for Floating wind and the success of these projects will drive export of this technology to the USA and Asia well before 2025. Planned development of large-scale projects aided with ample financial backing will continue to drive efficiencies and lead to significantly reduced costs. We see this trend in turn making European projects more feasible buoyed by additional government support of long-term Floating wind energy developments.

Charts, Tables and Graphs are sourced from our Q Vision Product Suite.

### Total FTUs Installed by Year

Status: Under development Planned Possible Cumulative Total Units



Large projects are spread across several years.

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# Sample Charts, Graphs & Tables - Continued

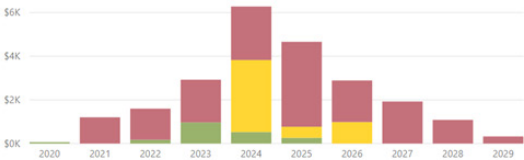


## Asia/Pacific Project CapEx

By Supply Chain Segment & Status | Under Development, Planned & Possible

Project CapExEst (millionUSD) by Status and Year\*

Status: Under devel Planned Possible

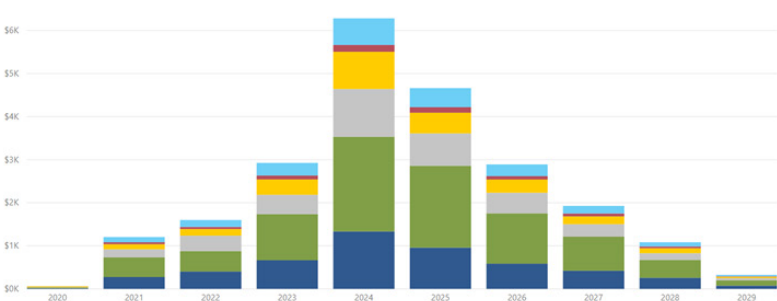


- As a whole, the Asia/Pacific opportunity sees potentially 815 units by 2033 representing 5.5 GW of installed capacity.
- On par with Northern Europe, Asia/Pacific developers and their supply chain are leading the charge towards improved project economics, more optimized CapEx per MW and ultimately lower LCoEs.

Charts, Tables and Graphs are sourced from our Q Vision Product Suite.

Project CapExEst (millionUSD) by Segment and Year\*

Segment: Substructure Turbine Mooring Cabling Installation Other



## Global Projects in CapEx by Project Size and Name

Under Development, Planned & Possible

Total Addressable Market (millionUSD)  
**\$62,769**

CapExEst by Project Name

- The offshore Floating wind industry was in its infancy only five years ago, an 'inner circle' that met more naysayers than believers. This industry has come a very long way in just a few years delivering new floater designs, scaled Demonstrators, Pre-Commercial projects and new players. The entry of companies such as Equinor, Repsol, SBM, Aker Solutions, Royal Dutch Shell and most recently Total has led to a step-change for this young industry's viability and ultimate capability to produce 50-to-100 (or even 200-plus) Floating Turbine Units (FTUs) on a serial manufacturing basis.
- Ten potential super-sized Floating offshore wind projects shown at right, each ranging between \$2.2 billion and \$10.8 billion in CapEx, represent a sizeable share (over 60%) of the \$63 billion total addressable market of presently identified Under Development, Planned and Possible projects.

Please see Appendix page 146 for full Status Definitions.

Under Development = Design underway & key milestones accomplished (turbine selection, financing, etc.)

Planned = Partially confirmed data such as floater type & realistic timeline, medium viability.

Possible = Projects with limited or partial/unconfirmed data. Fluid timelines and low viability.

Charts, Tables and Graphs are sourced from our Q Vision Product Suite.



Q Vision provides instant access to real-time data for the world's Fixed and Floating Wind Energy projects. Driven from Q FWE's proprietary database, these Microsoft Power BI tools allow for dynamic analyses of relationships across Markets and Technologies, and an enhanced understanding of project Economics including LCoEs.

Q FWE's Predictive Analytics and Market Expertise enable clients to see the consequence of change led from this rapidly accelerating market. Q FWE's Subscription Products provide timely and actionable strategic market information. *Data products refreshed weekly at a minimum, and within hours of important project updates.*

## Project Economics

### CapEx / LCoE

Q Vision is our proprietary **Business Analytics**' tool delivering real-time data and analysis giving you a competitive advantage to win **Fixed** and **Floating** Offshore Wind Energy projects. This *Microsoft Power BI* tool allows for dynamic analysis of relationships across markets and technologies; robust benchmarking as well as an enhanced understanding of project economics including LCoE. Subscribe now to see the consequence of change led from this rapidly accelerating market. Our **Subscription Products** provide timely and actionable, strategic market information. **The Q Vision database subscription includes an Excel data download containing over 120 attributes.**



## Offshore Turbine Locator

The report highlights Fixed and Floating offshore wind projects by total MW bubble size on a world map, cumulative total MW to 2030 and beyond, and cumulative Total MW by country, with the backing data on page 4. Each page has filters for Status, Region and Development Type.

A roundup of the known universe of Under Development, Planned and Possible Fixed and Floating wind projects, totaling the number of Turbine units in each project. Very handy for getting a quick overview of the potential future market for turbines, floaters, cables, installation and O&M activities. **Includes backing data in MS Excel.**



## Number of FTUs by Region & Hull Type



## Contact Us

Quest Floating Wind Energy, LLC  
Houston | Amsterdam | Rio de Janeiro | New York

International, maintaining our global energy insight from hubs in Amsterdam and Houston with support from our representatives in Rio de Janeiro, New York and London

**Paul Hillegeist**, President and Director  
Paul.Hillegeist@QuestFWE.com  
+1 832 862 3390

**Erik Rijkers**, Director - Market Development & Strategy  
Erik.Rijkers@QuestFWE.com  
+31 6 53350555

77 Sugar Creek Center Blvd. | Suite 310 | Sugar Land | Texas | 77478 | U.S.A.

corp@QuestFWE.com