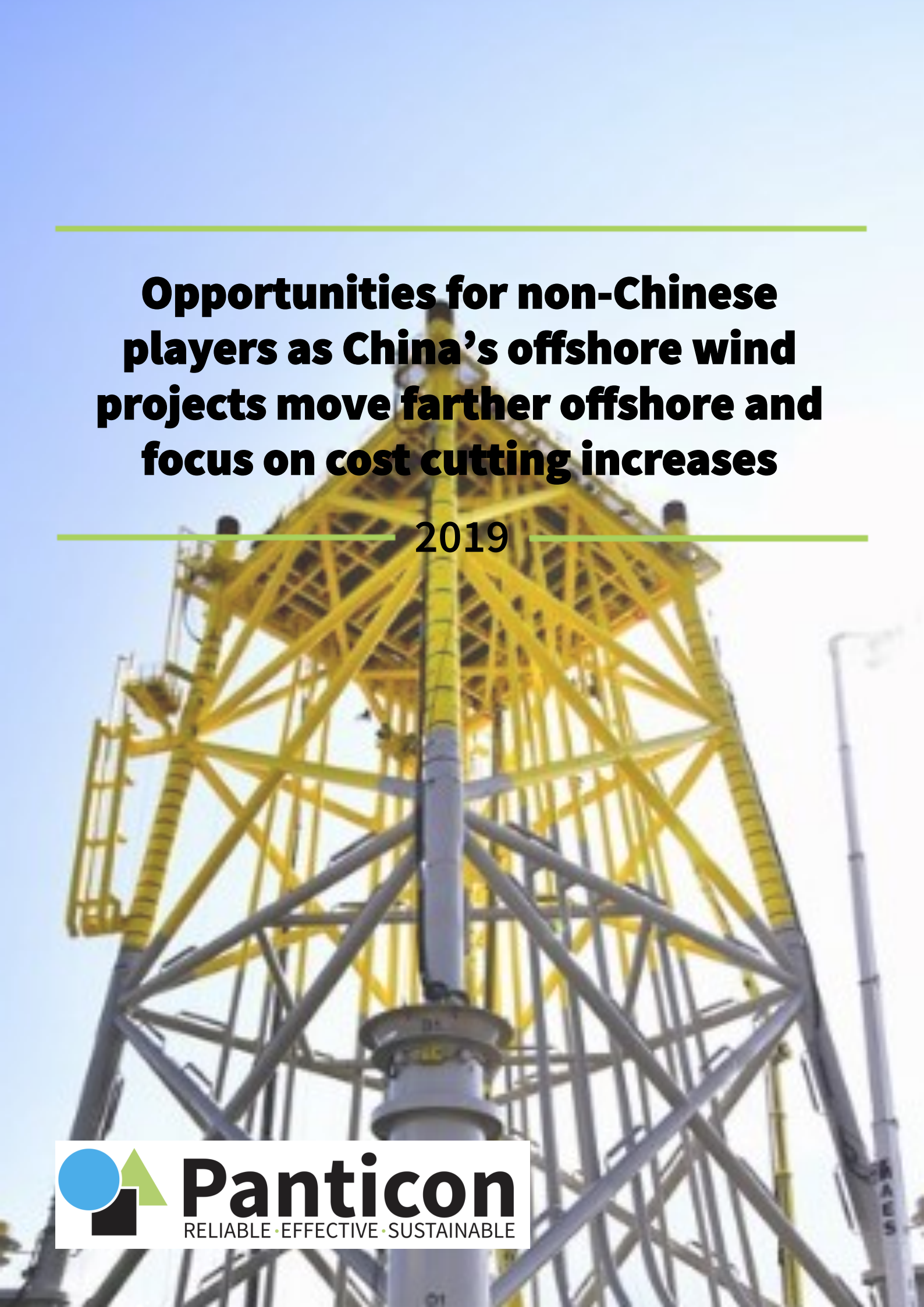
Opportunities for non-Chinese players as China's offshore wind projects move farther offshore and focus on cost cutting increases

2019



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Executive summary

China could become global number one offshore wind market by 2025. It became global number three in 2016. It consolidated this position in 2017 and, for the first time, recorded the highest global annual installations in 2018. The development has been driven by a feed-in tariff scheme. However, the progress has been slower than initially planned. Reasons include reliance on local suppliers whilst not embracing experienced suppliers from Europe, and lack of transparency in the way provinces awarded projects. Meanwhile, Chinese state-owned enterprises, including those from the coal and nuclear industries, have been diversifying into the offshore wind space via mergers and acquisition of experienced smaller local players as well as acquisition of entities outside China with offshore wind track record. The announcement in May 2018 to transition from a feed-in tariff scheme to an auction scheme from 2019 is expected to further favour the state-owned enterprises. In the drive to reduce costs, China's offshore wind market is likely to embrace more experienced foreign players not only at the development and consent life-cycle phase of the offshore wind farm but across the entire offshore wind farm lifespan.

Private image by Thomas Poulsen

This *Opportunities for non-Chinese players as China's offshore wind projects move farther offshore and focus on cost cutting increases* (the Report) is part of a series of reports on the global emerging offshore wind markets. The reports have been crafted by the Panticon team during the months of August through March, 2019 to mark the new name of the management consulting company. Panticon is particularly strong in the Offshore Wind and Logistics sectors within the three core disciplines of Strategic Management Advisory, Mergers & Acquisitions, and Market Research & Analysis.

The Report has been created using an extensive library of data sources (see Reference section). The main data sources used as the basis for the Report were made up of 500+ pages and mainly consisted of various publications by government related organisations, academic journal articles, offshore wind industry articles, and press releases by firms across the offshore wind market supply side as well as demand side.

The Report contains forward-looking statements, which by their very nature, address matters that are, to different degrees, uncertain as they pertain to the future. These, or any other uncertainties, may cause the actual future results to be materially different than those expressed in the forward-looking statements as contained within this Report. At Panticon, we do not undertake to update our forward-looking statements, nor do we assume any liability for actions or dispositions made by firms, organisations, and/or individuals based on information contained in this Report.

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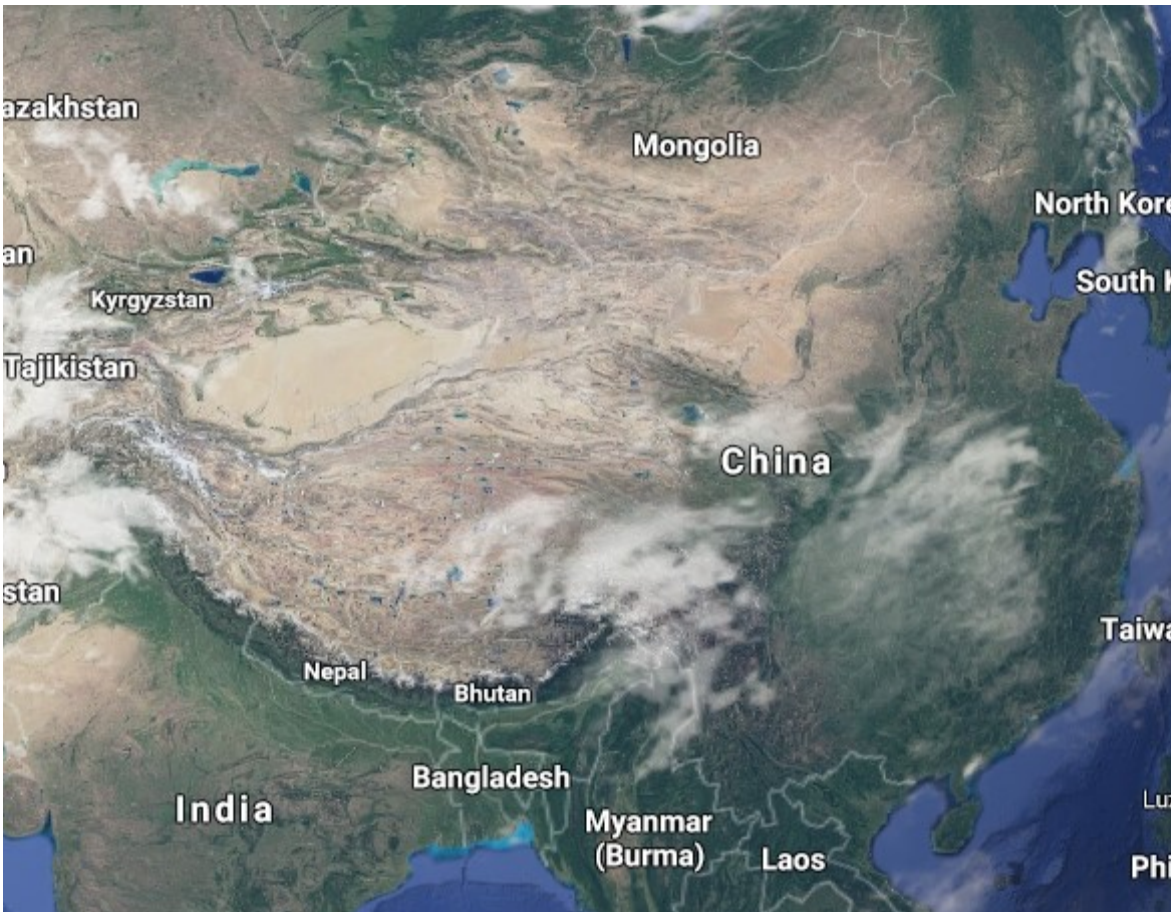


Image: Satellite map from Google Maps/cropped

Table of contents

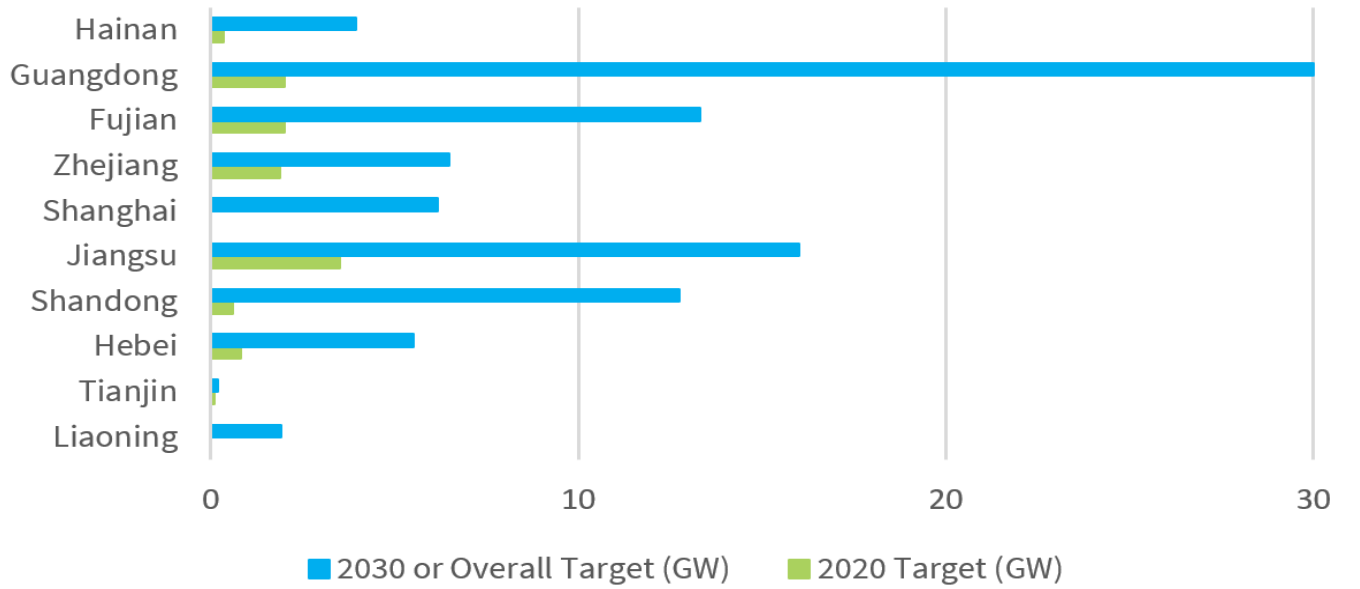
List of abbreviations

BRICS	Brazil, Russia, India, China and South Africa
CHN Energy	China Energy Investment Corporation
CGN	China General Nuclear Power Corporation
CNY	Chinese yuan
CREEI	China Renewable Energy Engineering Institute
CSIC	China Shipbuilding Industry Corporation
CTG	China Three Gorges
ECIDI	East China Investigation and Design Institute
EDP	Energias do Portugal
EDPR	EDP Renováveis
EPC	Engineering, procurement, and construction company
EUR	Euro
FIT	Feed-in tariffs
GE	General Electric
GW	Gigawatt
GWEC	Global Wind Energy Council
HDEC	PowerChina Huadong Engineering Co. Ltd
JV	Joint- venture
kWh	Kilowatt hour
MW	Megawatt
NDB	New Development Bank
NEA	National Energy Administration
O&M	Operation and maintenance
OWF	Offshore wind farm
R&D	Research and development
SOE	State-owned enterprises
SPIC	State Power Investment Corporation
UK	The United Kingdom
USD	United States Dollars
ZTT	Jiangsu Zhongtian Technology Co Ltd

1. Introduction

The Chinese Central Government's 12th Five-Year Plan for Renewable Energy (2011-2015) set ambitious installed cumulative offshore wind targets of five gigawatts (GW) by 2015 and 30 GW by 2020. Primarily due to the late (June 2014) introduction of feed-in tariffs (FITs), the 2015 target was not achieved. The Central Government has since revised the target to 5 GW installed offshore wind capacity by 2020 and 10 GW under construction by 2020, according to the 13th Five-Year Plan (2016-2020). In 2016, China added 592 megawatts (MW) offshore wind capacity and overtook Denmark as the world's number three offshore wind market after the United Kingdom (UK) and Germany. In 2017, it consolidated this position, adding 1,164 MW and bringing its cumulative total to 2,788 MW. In 2018, preliminary **Global Wind Energy Council** (**GWEC**) numbers show that China, for the first time, recorded the highest annual installations globally, 1.8 GW. The Jiangsu Province leads the offshore wind installations in China, followed by Fujian and Hebei. Meanwhile, Central Government targets are dwarfed by the aggregate coastal provincial targets which total 11.2 GW by 2020 and 92.6 GW overall (Figure 1).

Figure 1: Provincial offshore wind installation targets



Source: Panticon, September 2018, based on multiple sources

The Chinese government supports offshore wind development with a FIT of 0.85 Chinese yuan (CNY) per kilowatt hour (kWh) for offshore projects and CNY 0.75/kWh for intertidal wind farms. FITs were expected to remain unchanged until 2020.

However, in May 2018, the energy regulator, **National Energy Administration** (**NEA**), unveiled a new policy, the "*2018 Wind Farm Construction and Management Rules*". The policy requires that, starting in 2019, onshore and offshore projects should compete on price and gain government approval in auctions. Five provinces, including Guangdong and Fujian, have since released their offshore wind tendering policies.

In December 2018, the **State Administration for Market Regulation** and the **Standardisation Administration of the People's Republic of China** published the "*Technical requirements of wind turbine foundation for offshore wind farm*" to be implemented on 2 April 2019. The document specifies

environmental conditions as well as design selection and operation and maintenance (O&M) technical requirements of the offshore wind turbine foundation. It is applicable to future offshore wind projects including new projects, reconstruction, and extension of existing projects.

1.1. Factors favouring offshore wind development

China is keen to replicate its global onshore wind leadership to offshore wind and accordingly align policy to realise this goal.

Air quality: Need to utilise more sustainable energy to improve air quality.

Liberalised electricity wholesale markets: Reducing power generation from coal is necessary. In addition, coal generators must increasingly compete in liberalised wholesale markets while nuclear and renewable energy sources (including wind) are still guaranteed by regulators.

Limited and decreasing onshore wind power resources: Especially in regions close to the high-power demand major economic hubs in coastal areas of Shanghai, Jiangsu, Zhejiang, Fujian, and Guangdong.

Proximity to demand centres: Offshore wind power, unlike onshore, does not require long-distance power transmission to consumption areas. In addition, since offshore wind resources are located close to population centres, the problem of curtailment, which has affected onshore wind typically located in low demand areas, is avoided.

Pressure to diversify: Fierce competition and overcapacity in other sectors of the Chinese energy market is attracting the cash-rich state-owned enterprises (SOEs) to invest in the growing offshore wind sector.

Successful track record in other renewable energy technologies: Intention to replicate its onshore wind power and solar wind power success and become an offshore wind technology exporter.

1.2. Factors hindering offshore wind development

The desire to quickly transform local offshore wind champions into global leaders with limited foreign participation has limited and still threatens to limit offshore wind development in China.

Lengthy offshore wind power approval process: Four offshore wind power concession projects (1 GW) that finished tenders in 2010 were not fully approved until 2013.

Export-oriented mindset: Reluctance to import tried-and-tested equipment and expertise from Europe has led to a relatively steeper learning curve than would otherwise have been the case.

Geographically uneven distribution of offshore wind experience: Jiangsu Province is far ahead of the other emerging coastal province markets.

Different cost structure: High foundation installation costs due to soft soil in most parts of the seabed, particularly for inter-tidal projects.

Market and technology risk: High project risks stemming from immature technology in offshore wind turbines, lack of standardised regulations as well as constraints within the life-cycle phases of installation & commissioning and O&M.

Weather and river deltas: Unique challenges (including typhoons and soft soil conditions) different from the mature European offshore wind markets.

Limited offshore wind capability: Limited offshore wind farm design experience among domestic engineering firms. Much of China's installed capacity is intertidal and nearshore.

Competing interests: Near-shore military, fishing, and environmentally protected areas.

Limited offshore wind supply chain: Limited supply chain (including ports, vessels, and fabricators) to deliver the ambitious coastal provincial targets, especially for balance of plant components.

2. Offshore wind developers and owners

Offshore wind developers in China are exclusively local. European players, including France's EDF EN, have expressed interest but the picture looks unlikely to change. This is largely due to China's large SOEs' renewed interest in offshore wind as they seek growth both at home and abroad.

China General Nuclear Power Corporation (CGN)

- **CGN** is China's largest nuclear power plant operator
- In September 2012, it signed a deal with Chinese turbine manufacturer **Ming Yang** to co-develop wind projects, with a focus on offshore. The two agreed to co-develop the Golden Bay offshore wind farm (OWF) project in Jieyang, Guangdong Province as well as other onshore and offshore wind farms in Fujian Province
- In December 2013, **CGN** partnered with France's **AREVA** (later **Adwen** and now assimilated into **Siemens Gamesa**) to identify commercial opportunities in offshore wind in China and Europe with **AREVA** as offshore wind turbine supplier and **CGN** as an investor, developer, and operator of the wind farms
- In December 2017, **CGN** and the government of the city of Jieyang signed an agreement to develop an up to 3 GW deep-water OWF project off the Guangdong Province in the South China Sea. **CGN** also plans to set up an engineering and research and development (R&D) centre in Jieyang to develop the deep-water technology needed for the project**.**

China Longyuan Power Group (now part of China Energy Investment Corporation (CHN Energy))

- **China Longyuan Power Group (Longyuan)** leads China's offshore wind development. As early as 2014, it accounted for 35% of China's operational installed offshore capacity. Its inter-tidal site at Rudong in Jiangsu Province has served as the 'testing ground' for China's offshore products where almost all the major domestic manufacturers have installed multi-megawatt prototypes alongside Europe's **Siemens Gamesa** via its partnership with **Shanghai Electric Wind Power Equipment** (**Shanghai Electric**).
- In July 2017, Chinese authorities said they wanted to turn all big companies owned by the central government into limited liability firms or joint-stock firms by the end of 2017 and in August 2017, **Shenhua Group**, China's number one coal miner, and **China Guodian Group** (parent of **Longyuan**) merged to form CHN Energy . With combined assets of approximately USD272 billion, **CHN ENERGY** is now the world's largest coal-based integrated energy conglomerate and a global leader in renewable energy and cleaner use of conventional energy. Meanwhile, as at September 2017, **Shenhua**'s first offshore project, the 500 MW Dongtai OWF, was being built 45 km from shore.
- **Shenhua Group** has absorbed **Guodian Group** and become the parent of the re-organised entity.

China Three Gorges (CTG)

- **CTG** operates the world's largest hydropower plant, the 22.5 GW Three Gorges Project on the Yangtze River

- In June 2016, with intent to gain offshore wind experience, CTG bought an 80% stake in the 288 MW Meerwind Süd/Ost OWF project in the German North Sea from US private equity firm **Blackstone**.
- In May 2018, **CTG** launched a EUR 9.1 billion bid for control of Portugal's **Energias do Portugal** (**EDP**). CTG already owns 23.3% shares in EDP which it acquired in December 2011. The deal has dragged on and **CTG** temporarily put it on hold January 2019. Meanwhile, in January 2019, **CTG** completed the acquisition of a 10% stake from **EDP Renováveis** (**EDPR**) in the 950 MW Moray East OWF off Scotland. **EDP** owns 83% of **EDPR**.
- In July 2018, **CTG** completed installation of all 14 turbines at its 77.4 MW Xinghua Bay pilot project off Fujian Province. There were eight turbine suppliers, including the US' **GE**.
- In January 2019, **CTG** announced that various factors, including high local costs and limited domestic hydro (river) resources, mean that it will not develop any more hydro power plants in China but rather focus on offshore wind.

3. Local offshore wind supply chain development

As at end of 2018, China ranked as the world's number one onshore wind market as well as the world's number three offshore market. Chinese companies cover the entire offshore wind turbine supply chain with varying strengths at different life-cycle phases of the OWF lifespan.

3.1 Development and consent life-cycle phase

China has recently been opening up the offshore wind project management phase as project sites move farther offshore and the market acknowledges its limited local expertise.

Ramboll

- In May 2016, Danish engineering, design and consultancy company **Ramboll** won a contract from **PowerChina Huadong Engineering Corporation** (**HDEC**) to design **State Power Investment Corporation** (**SPIC**)'s 400 MW Binhai North Phase 2 OWF, becoming the first non-Chinese company to do so. The contract included design of 100 steel turbine foundations, a 400 MW substation, concept for the transformers, breakers and cables, as well as developing the design basis for waves, currents and geotechnical conditions.
- In June 2017, **HDEC** appointed **Ramboll** to design foundations for **SPIC**'s Binhai South H3 OWF off Shanghai Province.

ITPEnergised

- In January 2017, UK engineering consultancy **ITPEnergised** completed provision of advisory and due diligence review services to the **New Development Bank** (**NDB**), a multilateral bank established by Brazil, Russia, India, China and South Africa (the BRICS countries). The review was focused on the provision of sovereign loans for the new 250 MW phase of the Putian Pinghai Bay OWF project in Fujian Province.

KCI

- In December 2016, Beijing-based **Huadian Heavy Industries** selected the Netherlands' **KCI** for the design review, fabrication preparation, load out and installation of an offshore substation. **KCI** would handle the design review of both the topside as well as the foundation.
- In February 2017, **Huadian Heavy Industries** extended **KCI**'s scope to include taking care of the pile driveability analyses.

Atkins

- In June 2017, the **Atkins** part of Canada-based SNC-Lavalin Group was appointed by **HDEC** to design the offshore substation platform at **SPIC**'s 300MW Binhai South Phase 3 OWF in the Yellow Sea.

Others

- In June 2017, the **World Bank** selected a consortium of **DNV GL**, the **China Renewable Energy**

Engineering Institute (**CREEI**) and the **East China Investigation and Design Institute** (**ECIDI**) to draft Offshore Wind Technical Standards in China, including offshore wind turbine support structures, offshore substations and OWF power cables.

- In December 2017, UK government-industry body the Offshore Renewable Energy (ORE) Catapult entered an agreement with China's Tus-Wind and TusPark Newcastle for offshore wind technology co-operation. The deal included establishing a UK-China Technology Growth Accelerator to facilitate technology innovation and deployment by UK small and medium enterprises in China. It also included collaboration on the development of the Tus Offshore Wind Science Park and 500MW demonstrator in Shandong Province, including between 10% and 15% UK content. In September 2018, the parties formalised the deal to build the Tus-ORE Catapult Technology Research Centre in Yantai, Shandong province. The research centre was opened in March 2019.
- In February 2018, the Netherlands' **Fugro N.V.**, jointly with China's **ZPMC** and **Longyuan** (the **Longyuan Zhenhua** joint-venture [JV]) and **MSDI** (**Zhongnan Engineering Corp.**), executed site investigation at Yuedian Yangjiang Shaba OWF project off Guangdong.
- In June 2018, France's marine energy engineering specialist **INNOSEA Shanghai Investigation** signed an MoU with China's **Design & Research Institute** (**SIDRI**) to conduct joint research on offshore wind metocean surveys.
- In June 2018, the NEA and the Ministry of Energy, Utilities and Climate of Denmark signed an Implementing Agreement of Quality Offshore Wind. The aim is to create a platform to facilitate increased cooperation between Chinese and Danish government organisations in the offshore wind sector

3.2 Installation and commissioning lifecycle phase

China is gaining momentum in the installation and commissioning life-cycle phase as the annual installation volume picks up speed across more provinces along the coast line.

3.2.1. Offshore wind turbines

Offshore wind turbine supply has been dominated by local players including **Shanghai Electric**, **Goldwind**, **Envision**, **China Shipbuilding Industry Corporation** (**CSIC**) **HZ Windpower**, and **XEMC Windpower**.

- None of these produce the 8-9 MW-plus offshore turbines trending in Europe except **Shanghai Electric** via its licensing partnership with **Siemens Gamesa**. **Siemens Gamesa** had been in JV with **Shanghai Electric** since December 2011. The JV was terminated in September 2015 and replaced with a licensing agreement including **Siemens**' 6 MW offshore turbine. **Siemens Gamesa** has since extended the licensing twice - to its 7 MW offshore wind turbine in December 2017 and the 8 MW machine in March 2018

- Meanwhile, more signs of the Chinese offshore wind market slowly opening up to foreign players came in March 2017 when the US' **General Electric** (**GE**) signed a deal with **CTG** to supply three of its 6 MW Haliade offshore wind turbines for a pilot offshore array in the Fujian Province. The installation was completed in 2018 with nacelles for the turbines delivered from the former **Alstom** plant in France (**GE** acquired **Alstom**'s power and grid businesses in 2015) while blades came from the **LM Wind Power** plant in Denmark (**GE** acquired **LM Wind Power** in 2017)

3.2.2. Offshore wind turbine components

China is home to several top global wind turbine component suppliers which cater to both the Chinese and global markets.

Power converters

- In January 2016, **GE Power Conversion** signed a contract with **Shanghai Electric** to supply (from **GE**'s Shanghai facility) 4 MW Fully Fed LV3 wind converters for **Shanghai Electric**'s offshore turbines totalling 1 GW. In October 2016, the **GE Power Conversion** business announced it was to supply (from GE's Shanghai facility) its 5 MW medium-voltage (MV) converter based on the MV7000 product platform to XEMC Windpower.

Blades

- In November 2016, Denmark's **LM Wind Power** signed a strategic collaboration agreement with wind turbine manufacturer **CSIC HZ Windpower** to deliver blades for **CSIC**'s newly launched H151-5.0MW offshore wind turbine. **LM Wind Power**, now owned by US-based **GE**, has one of its' Chinese manufacturing plants in Jiangyin, China. In October 2017, it announced it is increasing the plant's manufacturing capacity following supply deals with leading Chinese turbine makers **Goldwind** and **Envision**.

Towers

- In December 2016, **Shandong Iraeta**, a Sino-Spanish JV, was contracted to supply 155 flanges for wind turbine towers at two **Longyuan** OWFs – 200 MW Dafeng and 300 MW Jiangjiasha - in Jiangsu Province.

Lifting equipment

- In January 2017, Finland's load handling equipment manufacturer **Hiab**, part of **Cargotec**, signed a contract with an unnamed Chinese offshore wind turbine manufacturer to supply a minimum of 100 **HIAB** light-range loader cranes for use on an OWF in China.

3.2.3. Balance of plant

Balance of plant has lagged behind the wind turbine segment in China and has started to catch up.

3.2.3.1. Sub-sea cables

Local players continue to dominate the sub-sea cables market.

Jiangsu Zhongtian Technology Co Ltd (ZTT)

- **ZTT** has been active in offshore wind projects, particularly in Jiangsu Province.

- In March 2015 **CGN** contracted **ZTT** to supply 110-kV subsea cables for the 152 MW OWF project off Rudong, Jiangsu Province.
- In February 2016, **Huaneng Tendering** awarded **ZTT** a contract to supply 35 kV and 110 kV subsea cables for **China Huaneng Group**'s 300 MW **Huaneng** Rudong offshore wind farm situated off Rudong, Jiangsu Province.
- In November 2016, **China Power Complete Equipment Co., Ltd** (**CPCEC**) awarded **ZTT** a contract to provide 35 kV and 220 kV submarine composite cables with accessories for **SPIC**'s 400 MW Binhai North Phase 2 OWF.
- In September 2018, **China Energy Conservation and Environmental Protection Group** awarded **ZTT** an export cable (45 km of 220 kV cables) supply contract for the 300 MW Yangjiang Nanpeng Island OWF project off Guangdong Province.
- Meanwhile, **ZTT** entered the European offshore wind market in March 2017 when it won a contract from **TenneT** to supply and construct a 155 kV HVAC grid connection between the
- 497 MW **EnBW** Hohe See OWF and the 900 MW BorWin3 DC grid connection system in the North Sea.

Jiangsu Hengtong Power Cable Co., Ltd

- In April 2015, **CGN** contracted **Jiangsu Hengtong Power Cable** to supply a 55 km long 35 kV submarine optical composite cable with accompanying equipment for the 150 MW **CGN** Rudong OWF demo project off Jiangsu Province.
- In June 2018, **CGN** contracted **Jiangsu Hengtong Power Cable** to supply 220kV subsea power cables for the 400 MW Yangjiang Nanpeng Island OWF off Guangdong Province.

Orient Cable

- In December 2018, **Orient Cable** was contracted to supply the 35 kV submarine photovoltaic cable for the 300 MW **Huaneng** Jiangsu Dafeng OWF project, off Jiangsu Province.

The market is beginning to open for European players. In August 2017, UK cable protection systems specialist Tekmar Energy was awarded a contract to protect array cables on the 400 MW **SPIC** Binhai North H2 OWF project off Jiangsu Province.

3.2.3.2. Contractors

China's engineering, procurement, and construction (EPC) provider space is firmly in the hands of local companies. Key players include **CCCC** through their **CCCC Third Harbor Engineering Co** and **Shanghai Zhenhua Heavy Industries Corp** (**ZPMC**) subsdiaries. Also **Jiangsu Longyuan Zhenhua Marine Engineering Corp** (the JV between **Longyuan** and **CCCC**'s **ZPMC**) and **PowerChina Huadong Engineering** (**HDEC**) are sizable constituencies.

- **Longyuan Zhenhua**, a 50-50 JV between **ZPMC** and developer **Guodian Longyuan** (now **CHN ENERGY**). In April 2018, the **Guangdong Electric Power Design & Research Institute awarded Longyuan Zhenhua** an EPC contract for monopiles and a substation for **Guangdong Electric Power Development'**s Guangdong Yudean Zhanjiang Wailuo OWF in Guangdong Province. In

- July 2018, **Longyuan Zhenhua** was awarded a contract to install foundations for **CTG**'s Liaoning Dalian Zhuanghe III OWF in Liaoning Province.

3.2.3.3. Foundation

The market for foundations is dominated by local players. Leading players include **ZPMC** and **Haili**. New local entrants are eyeing foreign markets. For example, in August 2017, **Jiangsu Yangzijiang Offshore Engineering**, a subsidiary of **Yangzijiang Shipbuilding**, entered into agreements with strategic partners to establish a JV company in China for offshore structure construction. The new company, **Jiangsu Yangzi Chengkang Marine Equipment Co. Ltd.** (JYCMECO), will mainly be involved in structure fabrication of steel pipe piles for international seas, ports, bridges and offshore projects, including offshore wind.

3.2.3.4. Installation vessels

Chinese companies have dominated this space so far. However, China's existing offshore turbine installation vessels are insufficient to support the country's announced offshore wind ambitions.

Subsequently, local players have announced fleet expansion plans, notably in November 2017 which saw a flurry of new vessel plans.

Longyuan Zhenhua (a ZPMC and Guodian Longyuan [now CHN ENERGY] JV)

- As early as 2014, **CHN ENERGY** (**China Longyuan Power** at the time), China's biggest wind developer, owned two 800-tonne self-hoisting crane vessels, designed for installing offshore turbines in water depths of up to 30 metres and capable of installing 300-350MW of offshore turbines annually.
- In October 2017, **Longyuan Zhenhua** launched a self-elevating jack-up vessel. The *Longyuan Zhenhua 3*, with a 2,000-tonne lifting capacity and 120-metre maximum lifting height, can operate in water depths of 50 metres. It is designed to serve the emerging trend in China's offshore wind market towards 6 MW and larger turbines.
- In May 2018, ZPMC delivered *the Longyuan Zhenhua 3* to **Longyuan Zhenhua**.
- In February 2019, **ZPMC** acquired CNY 420 million worth of shares (roughly 1%) in **Cosco Shipping Holdings** to help it expand its port equipment and other maritime businesses.
- **Longyuan Zhenhua** is looking at overseas markets as well and was involved in the construction of Taiwan's Formosa 1 offshore wind project.

COSCO

- May 2017: **COSCO** and Belgian **DEME** formed a JV to construct vessels in China, work together in the Chinese offshore wind market, and jointly work together outside China

ZTT

- In November 2017, power cables manufacturer **ZTT** contracted **China Merchants Heavy Industry** for the construction of two 600-tonne non-self-propelled jack-up platforms, capable of installing

- wind turbine components in areas with a sandy seabed and in a maximum water depth of 50 metres as well as carrying out offshore wind O&M tasks. The deal also included a non-self-propelled, full-swing crane vessel (1600-tonne lifting capacity and 110-metre hanging height) suitable for hoisting operations of various large and heavy components in offshore waters and harbours, as well as intertidal zones.
- **ZTT** is eyeing foreign markets as well.

CSIC

- In November 2017, manufacturing giant **CSIC** announced plans to start building a 1,200-tonne self -propelled installation vessel.
- In August 2018, **CSIC** placed a CNY374.5 million order at **CSIC's Dalian Shipbuilding Industry** for the construction of a wind installation platform scheduled for completion by Q2 2019.

China Railway Construction Corporation (CRCC)

- In May 2018, **CRCC** placed an order with **COSCO Shipping Heavy Industry** for a jack-up vessel with a lifting capacity of 1,300 tonnes.

CGN

- **CGN**, via subsidiary **CGN New Energy Holdings**, launched its first O&M vessel for offshore wind turbines at Yangzhou City's Yangtze River dock in Jiangsu Province.

Haidian O&M Company

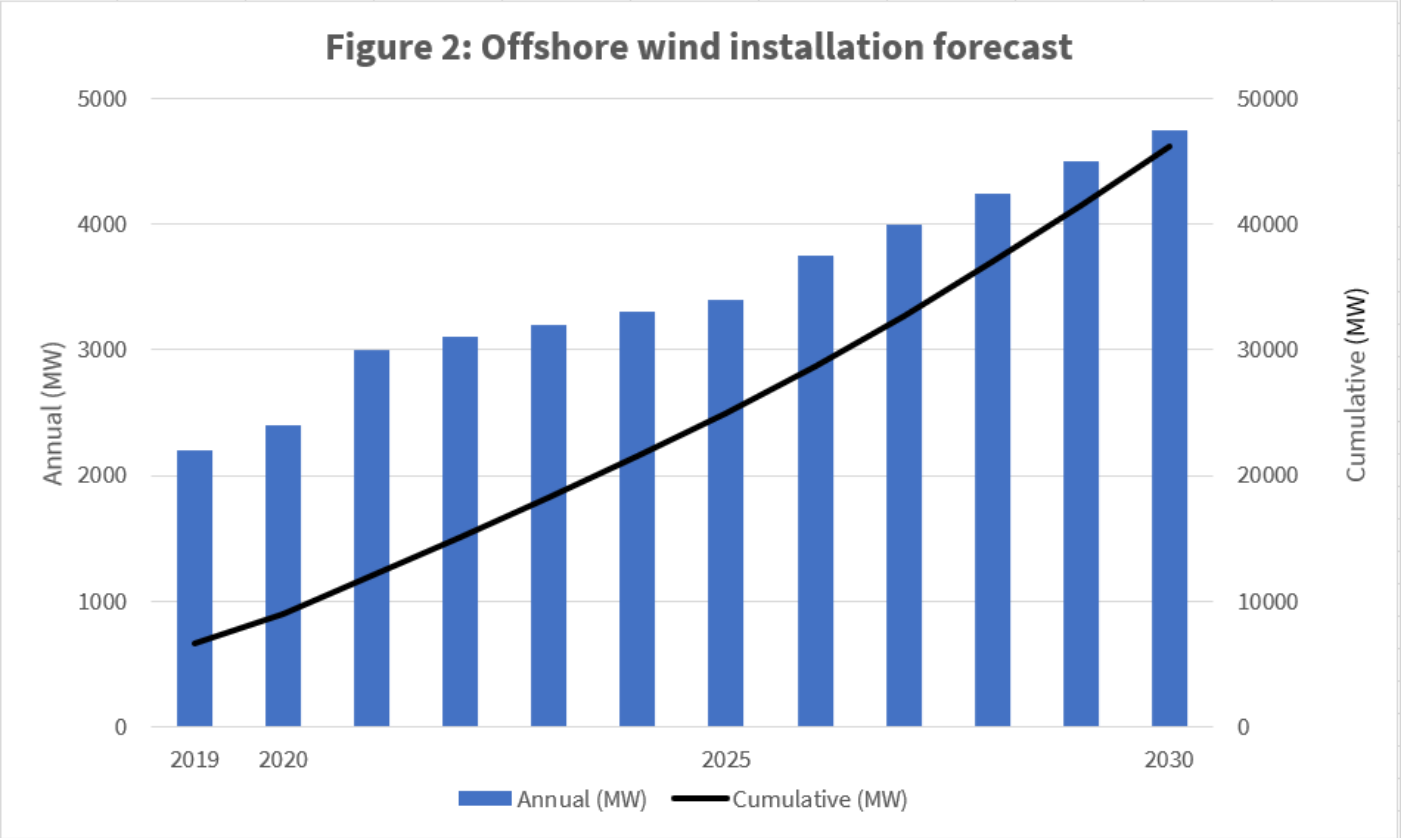
- Oct.2018**: Haidian O&M Company** (**FCIC- Fujian Fuchuan Investment Co., Ltd**.) contracted **FuJian MaWei ShipBuilding Ltd.** (Fujian Province) for the construction of a "600T Self-propelled Offshore Wind Heavy Lifting O&M Vessel"
    - Max. operating height of 120m
    - The vessel is expected to be delivered in early 2020

Ou Yang Offshore

- In October 2018, shipping group **Ou Yang Offshore** launched its first wind turbine installation vessel at the Dyang shipyard in the Jiangsu Province. The OuYang 1 is a self-propelled vessel and can work at 50 metre depths.
- The same month (October 3018), **Ou Yang Offshore** ordered a second similar vessel.

4. Offshore wind installation forecast

In the context of the national and provincial offshore targets prior to the policy changes announced in May 2018 and ensuing developments in various provinces, particularly Guangdong, Jiangsu and Fujian, Figure 2 shows a conservative forecast up to 2030. The May 2018 ruling from NEA to implement auctions to replace the FIT from April 2019 is expected to favour large players with capabilities to develop large projects and reduce costs.



Source: Panticon, February 2019 (based on various sources)

5. Conclusion

With 4.6 GW of offshore wind capacity installed by the end of 2018 in China, the central government's 5 GW target by 2020 will be exceeded. The 2020 installed capacity will, however, likely be below the aggregate coastal provincial 2020 targets. Meanwhile, the May 2018 policy changes to transition from the FIT scheme to an auction scheme is expected to favour the developers and/or owners who, at present in China, are mostly SOEs. In pursuit to reduce project costs and become more competitive, these developers are likely to continue consolidating as well as integrate more into the offshore wind supply chain including turbine manufacturers. Acquisitions will not only include local players but very likely foreign ones as well. At the same time, opportunities are emerging for experienced foreign offshore wind players with capabilities to reduce costs. The installations may not be as fast as the announced ambitions, but in terms of cumulative installed capacity, China is likely to become the global offshore market leader by 2025. As projects move farther offshore, more opportunities will emerge for experienced European players since local players have mostly garnered intertidal experience.

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20. Tekmar Energy, 14 August 2017: Tekmar Energy awarded its first large contract in mainland China
21. Trade Council of the Royal Danish Embassy
22. TradeWinds

Who we are

At Panticon, we are particularly strong in the Offshore Wind and Logistics sectors within our three core disciplines of **Strategic Management Advisory**, **Mergers & Acquisitions**, and **Market Research & Analysis**. We are mainly focusing on the business side to improve our clients' performance, create value in the long-term, and to create sustainable competitive advantages.

How we create value

- Tailor-made strategies
- Support M&A endeavours
- Share knowledge
- Analyse markets
- Advise our clients in every aspect of our three core disciplines

Private image by Thomas Poulsen

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