What Happen to China Wind Power Market?

In the 21th century, electricity has become essential part of human's life. From the casual life to the busiest business practice. For example, in the era of technologies, we manage to use the electric devices like mobile phone, computer and electricity to generate light in our daily life. Similarly, in manufacturer, the machines operate in factory mostly are electric power generated. Moreover, many businesses start to electrified their product which is considered more environmental-friendly such as, smart products and electric vehicles (EVs).

China as one of the most developed country which equipped with the most advanced technologies in the world certainly will consume more electricity than the world's average consumption. In fact, as current most populated country in the world, China electricity consumption definitely is very massive.

As a secondary resource, electricity actually could be produced through many alternatives of primary resources, such as the non-renewables (coal, nuclear) and the renewables (wind, hydro, solar, biomass).

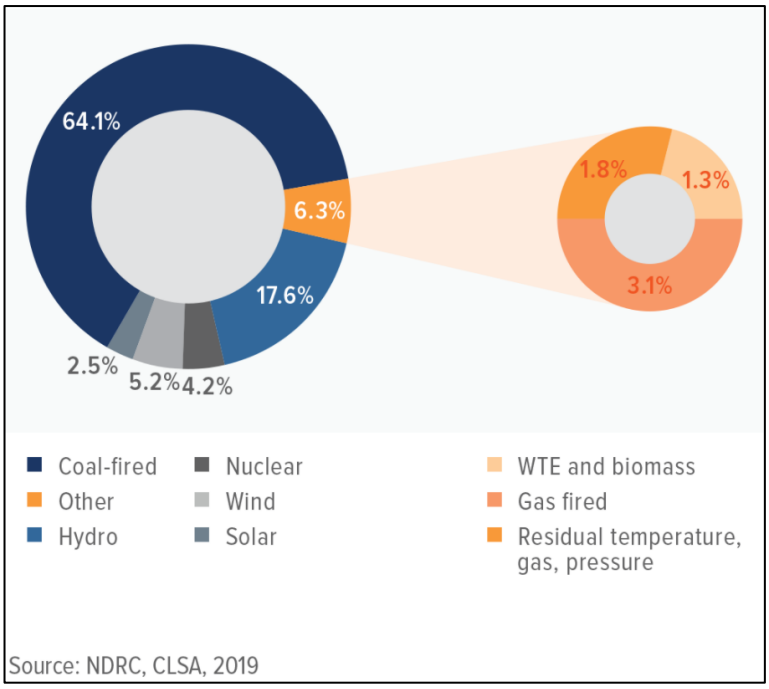

Figure 1. *2018 Power Generation Mix in China* (NDRC & CLSA, 2019)

According to NDRC and CLSA (2019)[1] in **Figure 1**, China's 2018 primary power generation is mainly from coal-fired which accounted for 64.1%. This is no surprise, as coal has been a key source of domestic energy consumption over decades (ChinaPower). The popularity of coal as primary electricity generation still prevails in 2020, yet it reduced by 3.1% which accounted for 61% (EMBER, 2021)[2].

Despite that, in **Figure 1** we can also see the renewable power generation still underwhelm in China. They only totalled by 25.3% which consist of Hydro (17.6%), Wind (5.2%) and Solar (2.5%). If we observe carefully, the wind and solar energy only 7.7% combined in 2018. Compare to coal-fired power generation, it is very concerning as wind and solar are the most affordable clean energy nowadays. Nevertheless, EMBER (2021)[2] recorded the renewables power production has slight increased with the total of 29% where 10% of them generated from solar and wind energy.

	Renewables	Carbon Emission	Availability/ stability/ seasonality	Boost income for farmers	Air pollutant emission control	Postive environmental impact	Building time
Biomass	Yes	Yes	High	Yes	Basic coal-fired emission control	Reduce air pollution from straw burning	1-2 years
Waste-to-energy	—	Yes	High	—	Ultra-low emission standard	Solving problems from MSW	1-2 years
Coal-fired	—	A lot	High	—	Ultra-low emission standard	—	1-2 years
Gas-fired	—	Yes	High	—	Lower emission than coal	Cleanest-burning fossil fuel	1-2 years
Hydro	Yes	Low	Seasonal	—	No need	—	Long
Nuclear	—	Low	High	—	No need	—	>5 years
Wind	Yes	Low	Low to medium	—	No need	—	<12 months
Solar PV	Yes	Low	Low to medium	—	No need	—	<12 months

Source: CLSA, 2019

Figure 2. *Comparison of Major Power Sources in China.* (CLSA, 2019)

In **Figure 2,** CLSA (2019)[3] showed Coal-fired power also emitted a lot of carbon emission which result to more air pollution and Green House Gas (GHG) released to the atmosphere. This also supported by ChinaPower which stated burning coal might produce up to twice the amount of carbon dioxide (CO_2) as other fossil fuels. They also recorded in 2018, China coal's emitted 7.25 Gigatons CO_2 which accounted about 20% of world CO_2 (ChinaPower).

Since 20th century, due to huge consumption of coal, China made several significant commitments to address global climate change through the 2015 Paris Agreement. As part of the agreement, China committed to peaking its carbon emissions by 2030 and increasing the share of non-fossil fuels consumption to 20% of total consumption simultaneously (ChinaPower). In March 2021, the Chinese government declared 14th Five-Year Plan to tackle China's economic, social and environmental issues for both short-term (2025) and long-term (2035). Specifically in **Chapter 3; Section 2**, they planned to reduce the CO_2 by 18% and energy consumption per GDP by 13.5% by the year of 2025. Furthermore, President Xi Jinping also encourages through official declaration in 2020 UN General Assembly which stated China will strived to achieve carbon neutrality by 2060.

Therefore, to reach carbon neutrality, the government need start to promote cleaner and renewable energy resources such as wind, solar and hydro power. NDRC and CLSA (2019)[1] showed Chinese government provided subsidies towards 2018 wind power (0.17 RMB/kWh) and solar power (0.48 RMB/kWh) construction tariffs. This has yielded the accumulation of 184GW (**Figure 3**) wind power and 175GW solar power capacity generated by 2018 for China. Moreover,

we already stated before whether there is 3.1% reduction in China's coal production and small increase in China's renewable power generation by 2.3% from 2018 to 2020 (EMBER, 2021)[2].

As we can see in **Figure 2**, wind and solar power have similarity in the cost-efficiency. Whereas, hydro power technology is more expensive, requires more build-time and it only occurs in seasonality. Therefore, both wind and solar power are the most efficient and reliable sources to produce electricity in China nowadays. In this report, we are going to focus on wind energy generation in China.

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Below is the data of total available China wind power capacity by years from 2014 to 2020,

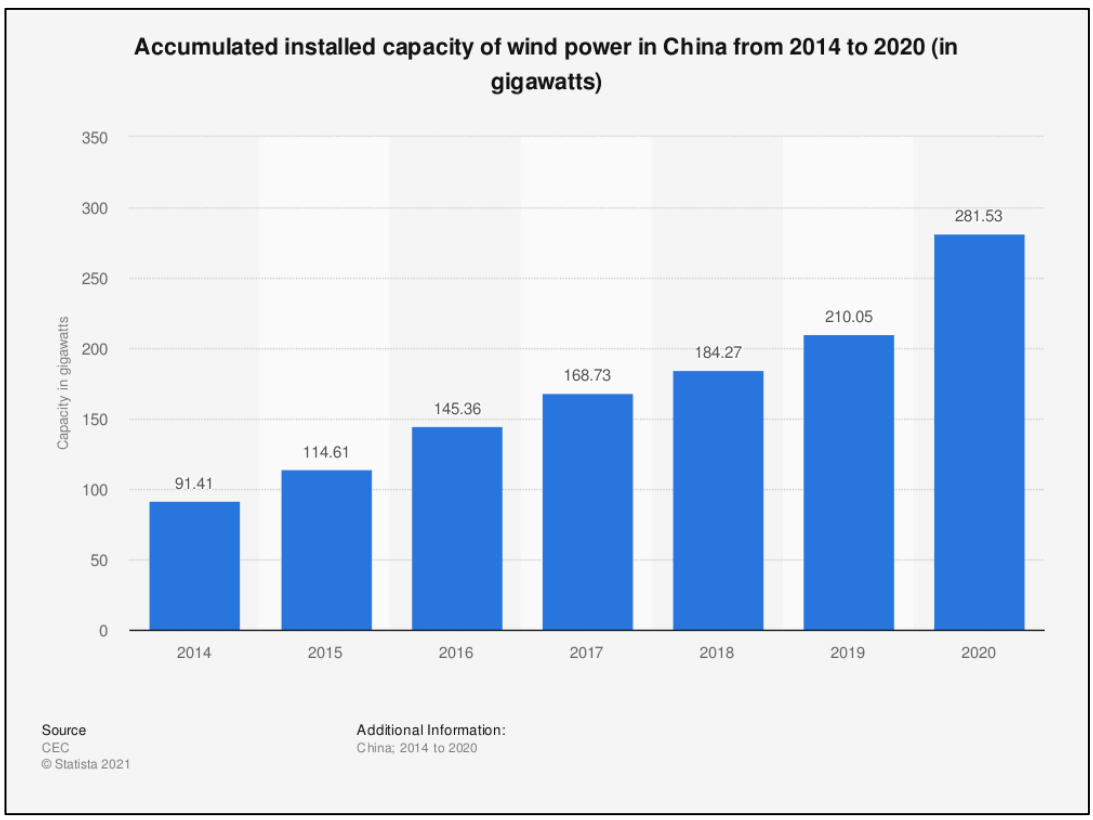

Figure 3. *Accumulated Installed Wind Power Capacity in China 2014-2020* (STATISTA)

As we can see from **Figure 3**, China's new wind power capacity always increased steadily with around 20-35 GW per year. Until 2020, it had sudden growth with approximately 71.5 GW of new wind power capacity. According to past record, 2020 China's new wind power capacity doubled 2019 new capacity which is 71.5 GW and 35.7 GW respectively. Another similar finding from the National Energy Administration (NEA), they also announced that a staggering 71.7 GW of new wind capacity was installed 2020.

GWEC (2021)[4] added the 71.7 GW figure represents the total grid-connected capacity in China in 2020, and not necessarily the year in which wind turbines were installed. Instead, 52 GW out of 71.7 GW was the actual new capacity which produced from the wind turbines in 2020 only in China. Despite the reduction, China actually broke the world record for most wind power capacity installed in a single year in 2020 (GWEC, 2021)[4]. Moreover, Ben Backwell, CEO of the Global Wind Energy Council particularly stated, Qinghai (青海) as one of the leading provinces in solar and wind energy in China. More than half of the energy they produced is renewables. He hopes that more China regions and market could learn from Qinghai (青海).

A GWEC head of market intelligence and strategy, Feng Zhao (2021)[5] claimed that "The incredible and rapid growth of wind power in the region has been led by China, which now has more wind power capacity than Europe, Africa, the Middle East, and Latin America combined". This claim also supported by NSEnergyBusiness (2020)[6] stated China and USA are two juggernauts with the highest wind energy capacity installation in 2020. Despite being top 2 countries, there was actually a huge discrepancy between 2020 China and USA total wind power capacity. According to International Renewable Energy Agency (IRENA) data in **Figure 4**, China owned the total of 281,992 MW and USA with total of 117,744 MW wind power capacity. As we can see, China total installed is more than double of the USA total installed. IRENA (2021)[7] also found that China and USA added 72.4 GW and 14.2 GW of new wind power respectively in 2020. Considering, global new wind capacity expansion reached 111 GW in 2020, this means China accounted for about 65% of total world new wind energy. With these figures, there is no doubt China became the giant market of wind power source in 2020.

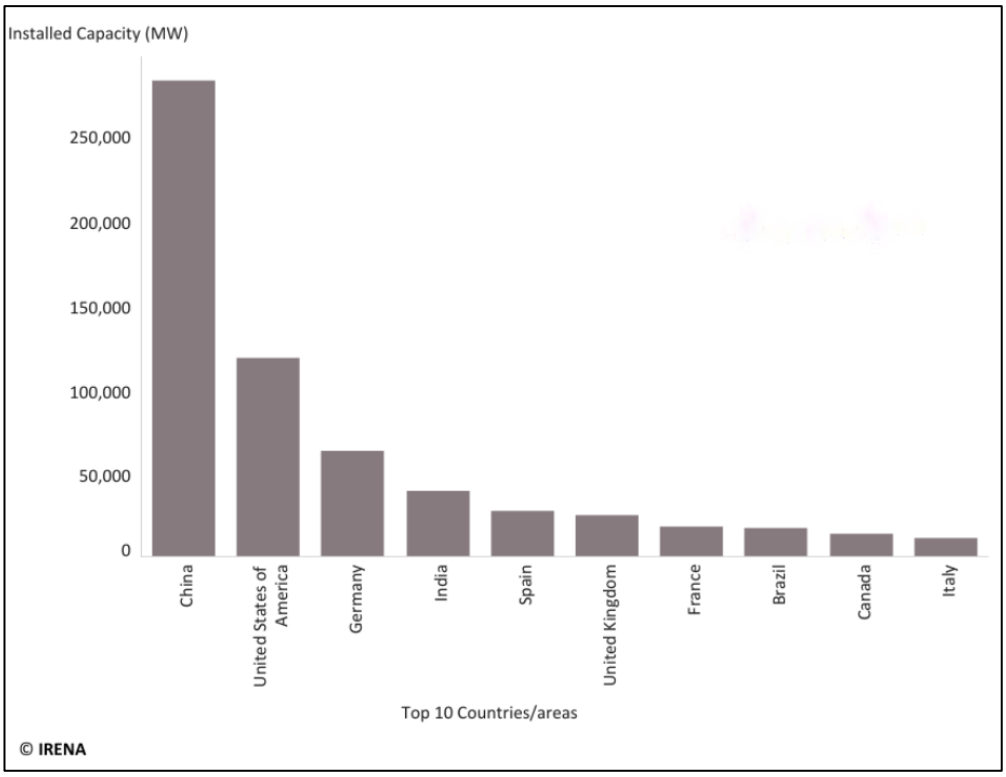

Figure 4. *World Ranking for Total Wind Energy Capacity Installed by 2020* (IRENA)

We would like to see what certain reason which drive this rapid growth of China wind power source. First reason is goals set by the president and Chinese government towards more sustainable future. As we know, China claimed to achieve the 2060 carbon neutrality, declared by President Xi Jinping in the 2020 UN General Assembly. Moreover, on 11 March 2021, Chinese Government declared 14th Five-Year Plan which includes:

- **Chapter 11, Section 3**: Promote wind energy as low-carbon, clean, safe and efficient energy system. By increasing the number of capacities and accelerating the offshore wind development.
- **Chapter 38, Section 4**: Implement national contribution to reach climate change goal in 2030 and peaking carbon emission before 2030. One way is by promoting low-carbon, clean, safe and efficient use of energy. Another way, by increasing the control of other greenhouse gases (GHG) such as methane, hydrofluorocarbons, and perfluorocarbons.

It is predicted with these goals and plan, wind as well as other renewable sources are likely to grow even further as coal plants are gradually retired to meet decarbonisation goals. According to GWEC, 277 GW of wind power could save about 408 million tons of CO_2. This implies 1 GW would reduce 1.47 million tons of CO_2. Thus, with current China's wind power capacity of 281.5 GW, China had saved 413.805 million tons of CO_2 in 2020.

Another reason is the ambitious policies by the local government which has made wind and other renewables extremely cost-competitive. In 21 May 2019, National Development and Reform Commission (NDRC) issued the new wind power Feed-in-Tariff (FiT) policy. Feed-in-Tariff is a government subsidies type which precisely in order to promote the renewable energy culture. The government will the cost of the electricity usage produced by renewable energy and if there is surplus power that connect to power grid, the owner will gain income which usually called "export tariff". In China, the new 2019 wind power FiT is subjected for both onshore and offshore wind power. Projects approved in 2019 and 2020 will enjoy the 2019 FiT and 2020 FiT respectively if they are connected to grid by the end of 2021. On 20 May 2019, NEA announced 4.51 GW of subsidy-free utility-scale wind power projects. The distribution of first batch can be seen below in **Figure 5**,

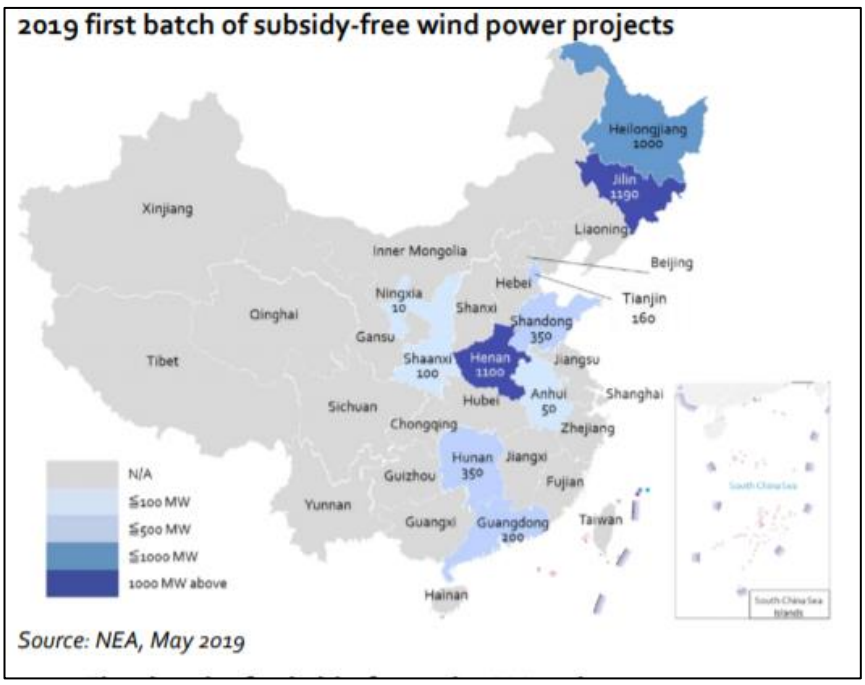

Figure 5. *First batch of wind-power project subsidies 2019* (China Energy Policies)

However, starting 1st January 2021, all newly approved onshore wind projects will be zero-subsidy. Thus, this led to massive 2020 installations rush in China (GWEC, 2021)[8]. This explained the rapid growth of 2020 China's new wind power capacity. Yet, the offshore wind FiT still on going until the end of 2021, which means there will be more offshore wind power being built by 2021. Moreover, according to "Renewable Capacity Statistics" reported by IRENA (2021)[9], out of 2021 China's accumulated wind power capacity, 273,003 GW was built onshore and only 8,990 GW was built offshore. This shows whether there is still huge investment and opportunity for the offshore wind power to grow in the future, especially with current cutting-edge technology where the R&D sector invent many versatile and viable offshore wind turbines nowadays, like floating offshore wind turbines (Energy Iceberg, 2020)[10].

Despite its popularity, wind turbines have faced several challenges upon the pre-manufacture and post-manufacture. In this paragraph, I will split the challenge into two major challenges, which is environmental challenges and power efficiency challenges.

First, upon the wind energy construction, it releases the noise towards surrounding which known as noise pollution. Even after it being constructed, the sound of the working wind turbines produced by the engine and swishing sound from the rotation blade can be considered as the noise pollution as well (Ministry of Environment Denmark). Sometimes, this noise might influence the habitat of wildlife. For instance, the offshore wind turbines influence the fisheries, many fishes will avoid the area due to noise which finally impact the fisherman's business (Hagos, 2021)[11]. Beside the noise, sometimes wind turbines might harm the flying animals. According to Hagos (2021)[11], due to low visibility during the migration, some birds might be killed by the fan blade which is very concerning.

Second major challenge is the power utilization problem. Despite onshore wind power is built on the strategic place like hill or desert, but sometimes it could become waste due to low demand. For instance, the Gobi Desert, near the Mongolian border sits the Jiuquan Wind (酒泉风电) Power Base. Construction started in 2009, yet it remains unfinished and some turbines have even been switched off due to low demand (WIRED, 2020)[12]. WIRED (2020)[12] also found that the inability to smoothly connect large-scale wind power to the power grid resulting to power waste. CAIXIN (2019)[13] also added the power waste is due to the inadequate transmission infrastructure. Moreover, the government statistics recorded that total of 17.1% wind power was going to waste as of 2017.

Regardless that, such issues need to be brought out and tackle if there is possible alternative. Regarding to the environmental problem, it is inevitable to avoid once the wind power source is built. However, the best prevention is pre-construction stage. It is better to do early survey around the area, considering whether it is migration route for the birds or harmful towards habitats nearby (Hagos, 2021)[11]. Moreover, conducting a well-designed socio-economic survey of the fishing communities and other stakeholders of the marine environment for offshore wind power. Similarly, done for the onshore wind power, for example consent from the ecological parties or residence (Hagos, 2021)[11]. Finally, for noise cancellation it is inevitable to get rid of all of the noise, yet it is possible to mitigate it. Along with current technology, researchers managed to invented new modern wind turbines which emit significantly less noise (Ministry of Environment Denmark).

Before jump into the power capacity efficiency solution, we should keep in mind that the wind energy is an inconsistent source. This means they need to be built on the area where the strong wind exists like hill, desert and shore (WIRED, 2020)[12]. As an initial step, it is very crucial as wind is the primary source to activate the wind turbines. Next, to avoid power waste, it is recommended to consider location, distance and accessibility prior the construction. This means, the enterprises or government need to built the wind farm where the wind power exists, also

closer the distance between the power grid and village/city will ease the transmission since it does not require a lot of cable. Finally, they also need to consider the number of wind turbines regards to the capacity of the power grid to avoid power waste (Yijun, 2019)[13]. In East China, the offshore wind powers have huge impact, since the industrial cities near the East coast of China is well populated and by utilizing the strong wind from the sea. Many benefits came from the offshore wind power such as, easy to transmit, easy for the inhabitant to consume the energy and more money to made due to larger economy (WIRED, 2020)[12].

On the bright side, we know that wind energy is very significant towards the world carbon neutrality goals. Despite the challenges, some solutions have been addressed above. It is very certain that wind energy will become more popular due to more benefit ahead. Ben Backwell, CEO of the Global Wind Energy Council stated there was 53% rise for global new installed wind capacity in 2020 compare to last year, which is significant. Feng Zhao (2021)[14] also found that 2020 was actually an incredible year for the wind industry, especially turbine manufacturers in China and America which became the main reason of the 2020 wind industry popularity.

However, the top suppliers for wind energy in 2020 came from a Danish manufacturer Vestas (维斯塔斯) with total installations of 16,186 MW. Vestas has reigned the first position for 5 years straight. This is due to its geographic diversification strategy, such as new installations in 32 markets in 2020, and strong performance in the US, Australia, Brazil, Netherland, France, Poland, Russia and Norway (GWEC,2021)[15]. On the second position sit American manufacturer GE Renewable (GE 可再生能源), in 2020 they recorded 14,135 MW of wind energy installation on both US and Spain. With these number of installations, they managed to be the number one supplier in the US the second year in a row.

Goldwind (金风科技) as the largest 2020 supplier in China, also rank third on the world ranking. With the total of 13.606 MW installations in 2020, Goldwind actually managed to achieve a record year in the local market with more than 12 GW installations and its new installations in overseas markets passed the 1 GW milestone for the first time. Despite being top supplier in China, strong competition still occurs with tier 2 local suppliers. On the fourth position sit another Chinese manufacturer Envision (远景能源), in 2020 they installed 10,717 MW wind power which is a record for the company (GWEC,2021)[15]. As we can see, the local incentive and FiT are the reason of strong market growth for 2020 China wind energy.

Despite the competition in local markets, achieve zero carbon also to promote more renewables and clean energy together still a must. It is important as our aim is reaching 2030 peak emission and 2060 carbon neutrality. The Chinese government has committed to reducing the portion of fossil fuel consumption and further aims to increase the generation of non-fossil fuel to 50% by 2030. This is in accordance with "The Revolution Strategy of Energy Production and Consumption (2016-2030)" that was announced in December 2016.

Forecast also brought out by some experts towards the future of China's coal and wind energy industry. NEA (2019)[17] forecasts coal power overcapacity in 12 provinces is expected to ease in 2022. This is due to the pre warning given by the government on how harmful if the locals still rely on coal consumption to generate power. Moreover, more than 400 wind power companies signed the 2020 Beijing Declaration (**Figure 6**) targeting at least 50 GW of annual wind installations in China between 2021 and 2025, followed by more than 60 GW annually from 2026 onwards to meet the country's target of reaching carbon neutrality target by 2060. (Evwind, 2021)[18]. From previous finding where 1 GW would reduce 1.47 million tons of CO_2, we can tell at least 73.5 million tons of CO_2 will be mitigated from 2021 to 2025 and at least 88.2 million tons by 2026.

Figure 6. *2020 China International Wind Power Conference (CWP2020) – Beijing Declaration on Wind Power* (Ecommerce China Agency, 2020)

To sum up, China wind power industry has been very massive especially after 2019. This is due to FiT and incentive towards both onshore (end in 2020) and offshore (end in 2021) wind power. Some goals also being declared by both government and president to achieve sustainability future. This is important as in order to promote the usage of wind energy and lessen the coal-fired powered electricity in future. However, wind energy turbines could result in inefficiency power and environmental issue. Despite that, we have discussed and addressed the solution to minimize or tackle such issues. Therefore, with such benefit ahead, it is predicted that China has bright future for the wind energy industry. Since the offshore wind power still lacking in China, it is a perfect opportunity for enterprises to invest more in offshore wind power especially with the FiT for offshore wind power until end of 2021.