1. **Introduction electricity power background**

- 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 consider 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). According to NDRC and CLSA (2019) in Figure 1, China's 2018 primary power generation is from coal-fired which accounted for 64.1% (put more example of China's coal fired power data). Later it followed by Hydro and Wind respectively.

2. **Problem background, transition to renewable power**

- However, NDRC and CLSA (2019) In figure 3 showed Coal-fired power actually emitted a lot of carbon emission which result to more air pollution and release more Green House Gas (GHG) to the atmosphere.
- China made several significant commitments to addressing 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 used to 20 percent of total consumption within the same timeframe. (ChinaPower)
- Therefore, the government need start promote the cleaner and renewable energy resources such as wind, solar and hydro power. This also can be seen form figure 2 (NDRC and CLSA, 2019), the government provide subsidies towards 2018 wind and solar power construction tariffs. This has yield 184GW of wind power (9.7%) and 175GW of solar power (9.2%) generated in 2018 for China.

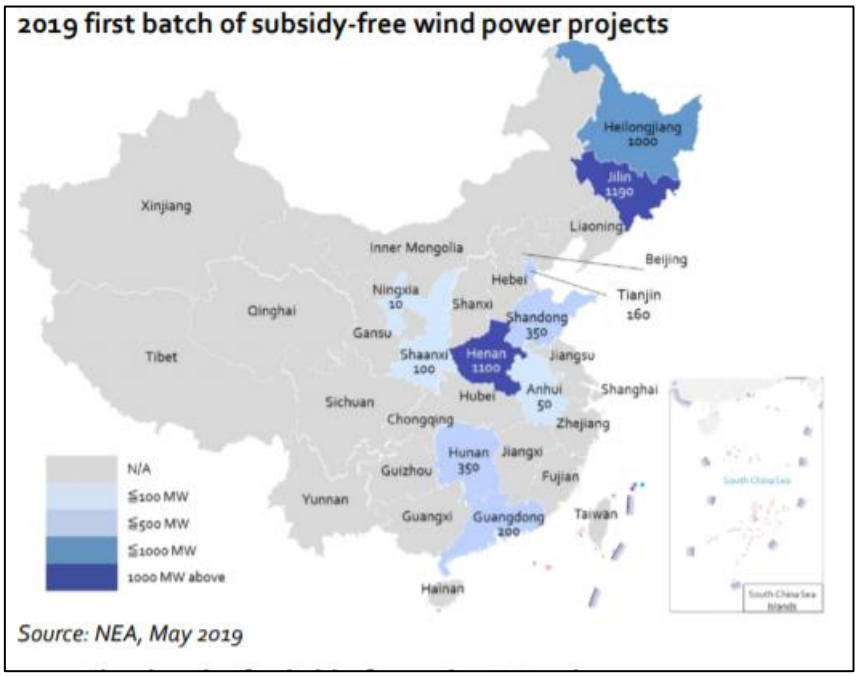
3. **Reason to choose wind power over others.**

- As we can see in figure 3, wind and solar power have similarity for the cost-efficiency as renewable resources. Whereas, hydro power technology is more expensive, requires more time build and it only occur in seasonality. Therefore, both wind and solar power are the most common resources to produces electricity in China nowadays.
- In the report, we are going to talk more related to wind energy generation.

4. **China Wind energy development (Market research 1)**

- In China the cumulative power generation through wind energy. (statista).. explain the data ---- Constant increase by years, rapid growth in the last 2 years
- The NEA announced that a staggering 71.7 GW of new wind capacity was installed 2020. GWEC (2021) 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.

- Turns out, 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).
- Feng Zhao quoted "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" (GWEC, 2021)
- **Country comparison**: China and USA are two juggernauts with the highest wind energy capacity installation in 2020 (NSenergybusiness, 2020). IRENA data showed China 2020 has the huge wind power installed. China with 281,992 GW totals installed and USA with 117,744 GW total installed. As we can see, China total installed is more than double of the USA total installed, this imply China's wind power source is colossal.
- **Reason 1:** In 2020 UN General Assembly, President Xi Jinping officially proposed incentive goal to reach 2060 carbon neutral. Wind as well as other renewable sources are likely to grow even further as coal plants are gradually retired to meet decarbonisation goals.
- **Reason 2:** Subsidies Government →
  - On 21 May 2019, NDRC issued the new wind power feed-in-tariff (FiT) policy. (NDRC)
  - 21 GW subsidy-free wind and solar PV projects published (NEA). First batch can be seen below




This is the reason rapid increase in 2019 and due to an installation rush in China last year due to the phase out of the onshore wind Feed-in-Tariff by the end of 2020. (Explain Feed-in-Tariff subsidies). (GWEC,2021)

The offshore wind FIT still on going until 2021, which still could potentially more wind power being built next year.

5. **Pros and Cons building wind energy, how to solve or reduce the issue (Market research 2)**

- From the data above, China has become the unquestionable leader in the global wind power industry. Despite the fact that China has outperformed other countries in term of installed capacity, it currently faces a number of challenges.
- **Challenge 1:** One challenge is the low utilization rate of onshore wind power. Normally, onshore wind power is built near the hill or dessert where strong wind power exists. However, even it is built on the strategic place but sometimes it becomes waste due to low demand. For instance, the Gobi Desert, near the Mongolian border, where the winds howl through the sparsely populated lowlands, sits the Jiuquan Wind Power Base. Building started in 2009, but the largest wind farm on the planet remains unfinished. Some turbines have even been switched off due to low demand. (Wired, 2020)
- **Challenge 2:** Another challenge is the inability to smoothly connect large-scale wind power to the power grid. Despite the area is covered with good wind source, sometimes the cable to distribute to the power grid is still limited. For example, ……(Wired, 2020)
- **Solution1:** Despite we know whether the wind energy is inconsistent source, therefore the government and companies need to consider geographically and technology prior construction. This is to avoid cost losses. For example, build wind turbines where both the wind power exists and close to inhabitant to avoid power waste. Moreover, with innovative technology, the experts need to make sure if the machine can withstand on the extreme weather condition as well.
- **Solution2:** Another solution is by building more of offshore wind power. Offshore wind has specific area to build which is should be close by the sea or coast. 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 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). Moreover, this could be implied on the major cities near the South China Sea as well especially with the feed-in-tariff (FiT) policy for offshore wind power end by 2021. (China National Renewable Energy Center, 2019)

6. **Case Study – Largest brand in China (Goldwind) and rank among the other brand** GWEC (2021)

- In 2020 both GE renewables (USA) and Goldwind (China) became the 2 biggest juggernauts on total capacity installed.
- **GE Renewable Energy** moves up two positions to the second place, mainly due to the explosive growth in its home market of the US and its strong position in Spain in 2020. Despite disruption caused by COVID-19 to local supply chains and project execution in the US, the American manufacturer reported more than 10 GW of installations at home last year, making it the number one supplier in the US the second year in a row.
- Chinese supplier **Goldwind** retains the third position in 2020, although it achieved a record year in its home market with more than 12 GW installations and its new installations in overseas markets passed the 1 GW milestone for the first time.

Goldwind still held the top spot in China last year, but the supplier lost market share at home due to strong competition from tier 2 local suppliers.

7. **Future of China Wind Power and Coal Power forecast**

- **More of non-fossil fuel consumption:** 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. (The State Council of The People's Republic of China, 2016)
- **Coal consumption reduce:** NEA (2019) 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.
- **Wind power future**: More than 400 wind power companies last year signed the so-called Beijing Declaration targeting at least 50GW of annual wind installations in China between 2021 and 2025, followed by more than 60GW annually from 2026 onwards to meet the country's target of reaching carbon neutrality target by 2060. (WindPowerMonthly, 2021)

8. **Result opinion suggestion (conclusion)**

- Restatement of China Wind Power Development.
- Future of China wind power towards other countries.
- Any suggestion/challenge/opportunity for company who already in the market/or who want to join, how to be more competitive?