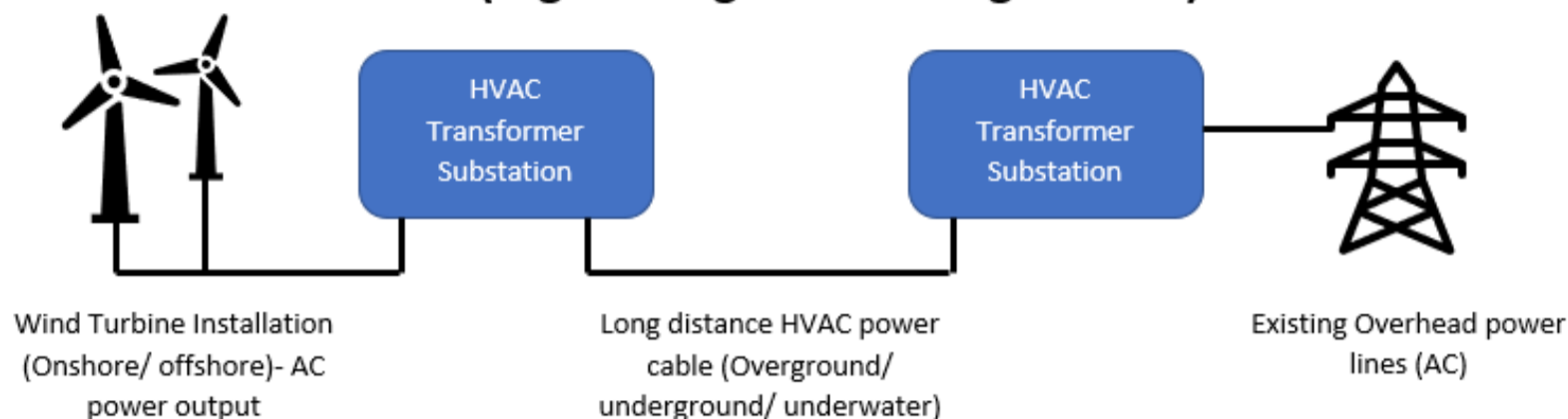
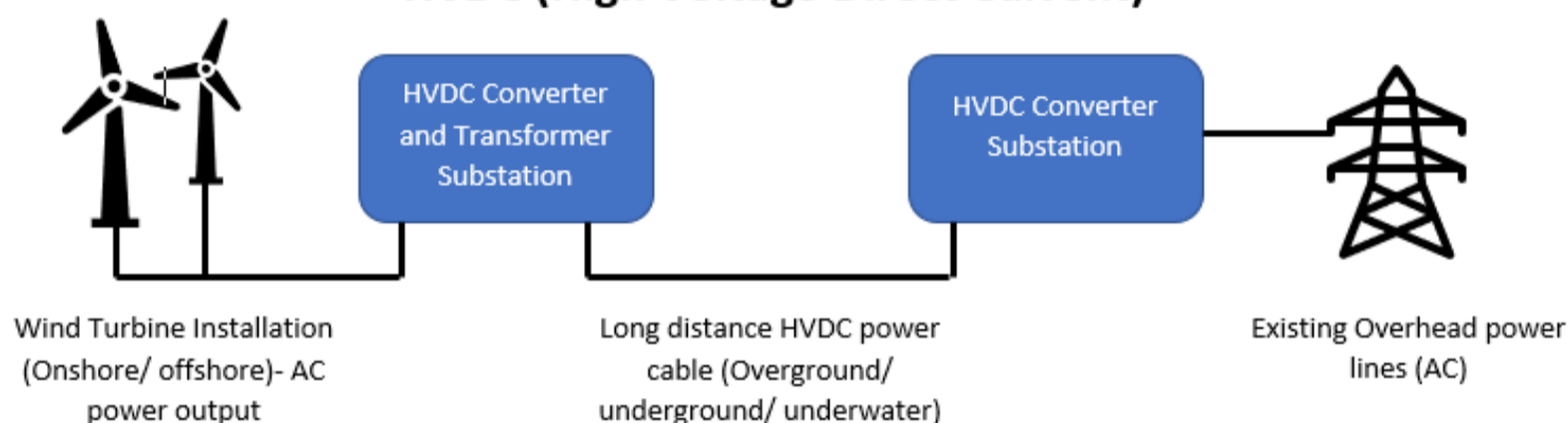


HVAC (High Voltage Alternating Current)



HVDC (High Voltage Direct Current)



What are wind turbines?

Wind turbines work on the principle of using the wind to turn a propeller– like blade which spins a generator creating electricity.

- Wind is a form of solar energy caused by the sun unevenly heating the earth's atmosphere, irregularities on the earth's surface and the rotation of the earth.
- Wind turbines can have several different configuration options that will be outlined in this factsheet

HVAC vs HVDC

HVDC (High Voltage Direct Current)- the AC electricity produced by wind turbines is converted to DC for transfer to point of use. This requires power converters DC inductors and other equipment, increasing the cost and complexity of a wind turbine installation. However, DC has smaller energy losses in cables, helping to increase the efficiency of energy transmission.

HVAC (High Voltage Alternating Current)- the electricity produced by turbines is transferred from a windfarm as alternating current after using transformers to convert to the required voltage. These transformers are relatively low cost in comparison to the equipment required to convert the electricity to DC. But energy transfer efficiency is reduced due to losses in cables.

The choice of HVAC vs HVDC varies depending on the project. The main factors to consider when deciding between the two are:

- Location– how far is the wind turbine installation from the point of use? The further the distance the more likely HVDC is to be preferred due to improved energy transfer efficiency.
- Power capacity of installation– a significant initial investment is needed for HVDC, therefore for a smaller installation it is more likely that a HVAC will be the most viable option.
- Power transmission cable type– underground/ underwater/ overground. The efficiency benefits of HVDC are more significant for underground/ underwater installations, so a shorter distance is required for it to be economically viable.

Horizontal axis vs Vertical axis turbines

Horizontal– the most common type of wind turbine with the large fan style blades. The blades are turned by the wind and can have a diameter as large as 252m. However, they are dependant on wind direction, therefore require the ability for the head to rotate according to the direction of wind.

Vertical– come in a variety of designs– in general they are far smaller scale and more likely to be used for domestic installations. They have the advantage of being omnidirectional, so do not require adjustment for varying wind direction.

Benefits of Wind Turbines

- Renewable energy source
- Inexhaustible - there is an infinite amount of wind
- Zero emission - there is no polluting emissions from turbines when in use
- Can be located in a wide range of places

Limitations/ Cons of Wind Turbines

- Only work when there is wind– not a consistent supply so cannot be the sole energy supply
- Noisy– cause noise pollution which can disturb wildlife and people
- Eyesore– installation can damage natural environments and many people dislike their appearance

References

[How Do Wind Turbines Work? | Department of Energy](#)

[HVDC vs. HVAC cables for offshore wind | Reuters Events | Renewables](#)

[2021 Feb – Transmission efficiency & recruitment opportunity – Innovative tools for offshore wind and direct current \(DC\) grids \(innodc.org\)](#)

[China debuts an offshore wind turbine with the world's largest rotor diameter \(electrek.co\)](#)

[What are the benefits of wind power? | ACCIONA | Business as unusual](#)