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EEE

HVDC Power Transmission



HVDC Power Transmission

The mode of power transmission in which high voltage **direct current** is used for transmission of electric power at large distances. Compared to HVAC the HVDC has smaller losses for long distance transmission.

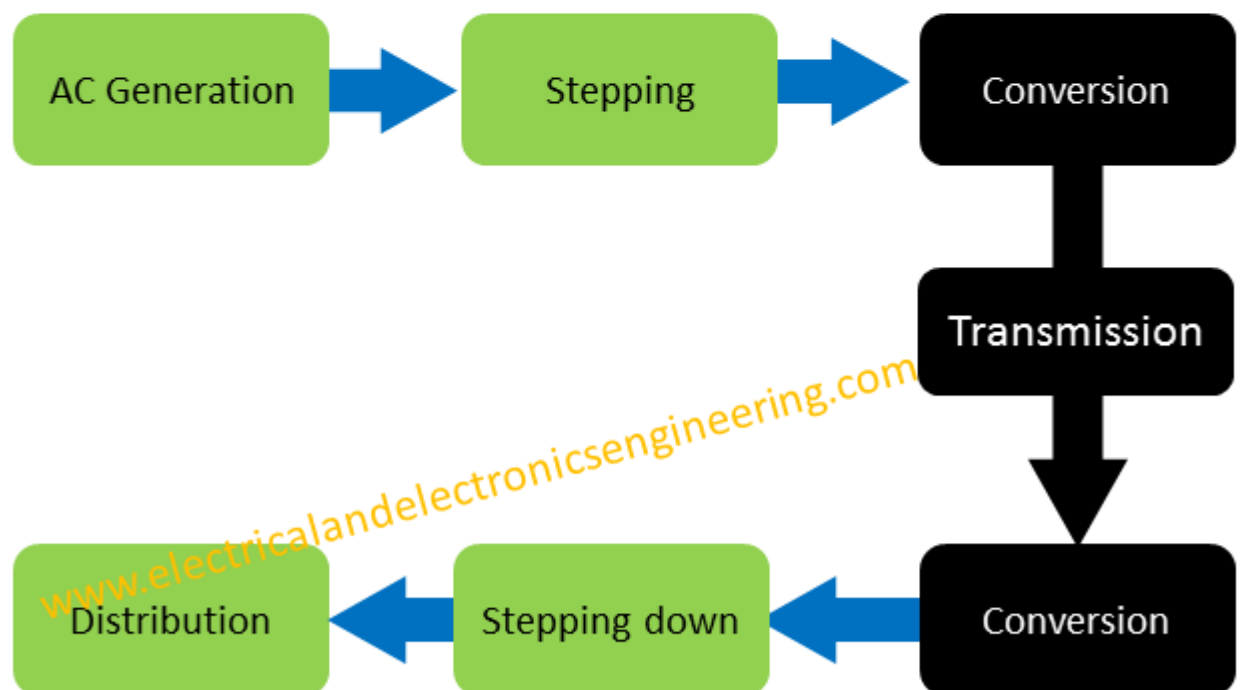


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How it works

In HVDC Systems the AC electric power is generated using generators. It is then stepped up using transformers. After this converters are used to convert AC to DC.

This DC power is transmitted at distant places. On the other end it is received and is again converted back to AC



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Advantages of HVDC



Undersea transmission



Lower investment



Smaller losses



Renewables Integration



Synchronization

Why to use DC

Majority of our home devices and equipment require AC

The alternator (synchronous generator) produces AC

Power can also be transmitted using 3 phase AC

Then Why to use DC for transmission?

Major reason is economical point of view

Losses are less in case of DC.

Technical study of technologies and comparison



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Technical Reason

1. No contribution to short circuit current

An HVDC transmission doesn't play any role in short circuit current of interconnected alternating current. In case of HVAC link from power plant to load center the short circuit current level increases which needs to replace circuit breakers as well as to increase the rating of equipment than it was before. In case of DC, an HVDC transmission system doesn't play any role in short circuit current of interconnected system.



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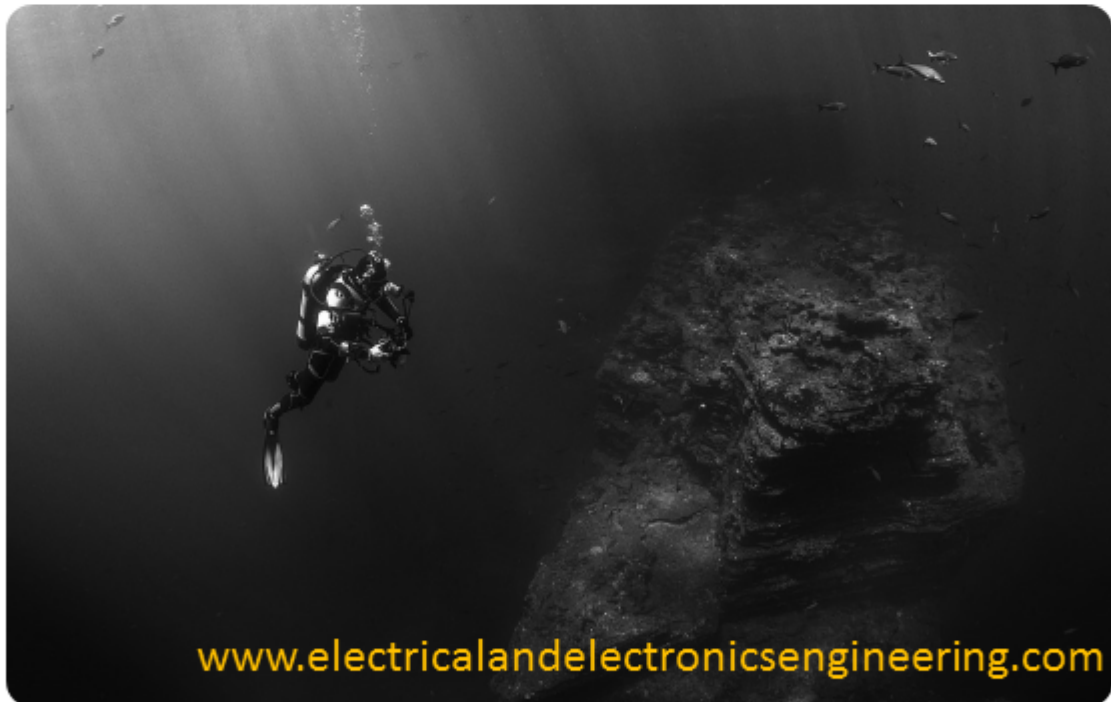
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Technical Reason

2. Long distance under water links

In longer under water HVAC spans the large cable capacitance causes large reactive power flow which limits the maximum possible transmission distance. In case of HVDC there is no limit.

For such longer spans the HVDC is the only choice for Engineers and power companies.



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Technical Reason

3. Connecting AC grids

Whenever two AC systems are to be connected they need to have same frequency and voltage.

HVDC on the other hand is asynchronous, it can adapt to any rated frequency and voltage. For this reason HVDC can be used to connect AC systems.



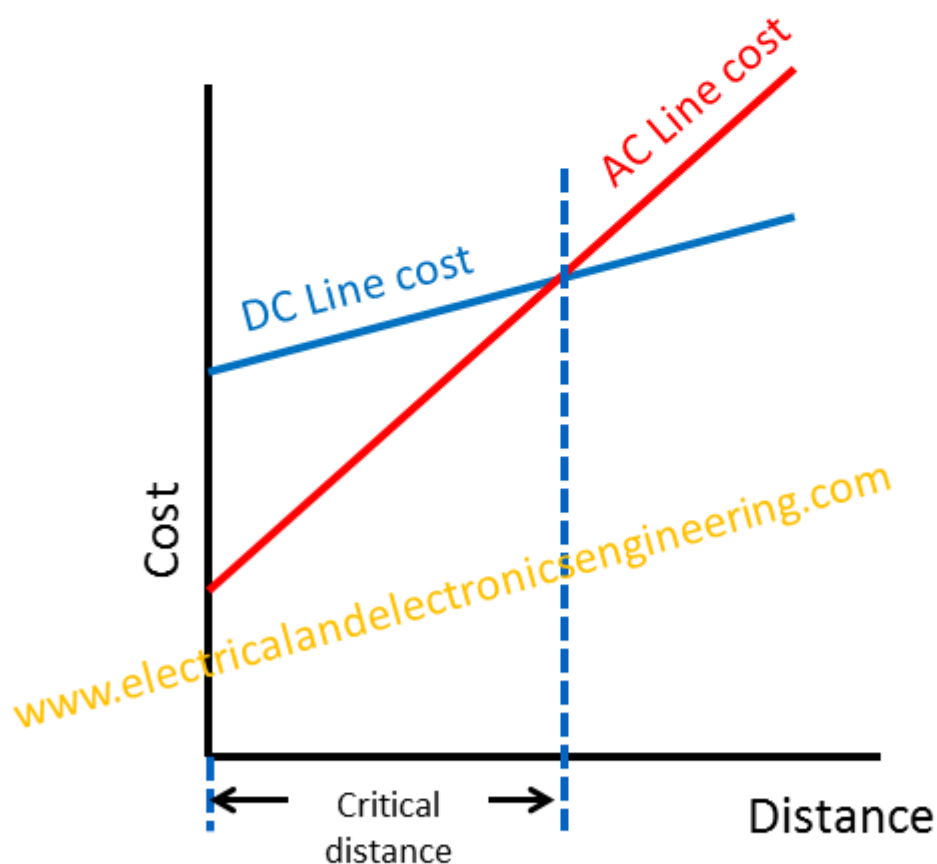
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Economical Reason

4. Lower investment cost

For transmission of power beyond breakdown distance (usually 700 – 800 km) the HVDC is more economical and has lower total investment for power transmission.



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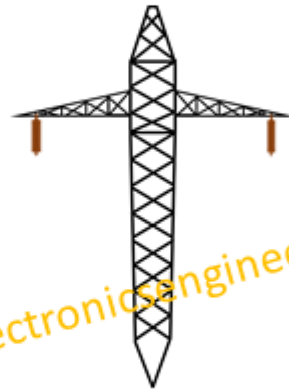
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Environmental Reason

5. Reduced ROW

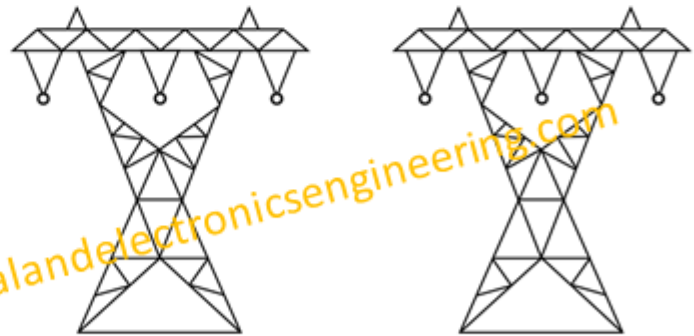
HVDC Transmission requires reduced ROW for HVDC poles. For illustration purposes a general comparison of HVDC poles is presented here. For same power transmission:

HVDC Transmission



← 60 m →

HVAC Transmission



← 150 m →



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