High voltage DC power transmission is being increasingly used in place of high voltage AC power transmission, particularly for seabed cables and long lines. This increased use is because of economic and technical benefits specific to DC power transmission.

Introduction
High Voltage DC technology is an effective and technical solution for the transmission of power over very long distances. This system is an economical solution to connect grids of different frequencies or asynchronous grids, too. This technology has some better qualities compared to AC power transmission and is the only alternative to high voltage AC transmission.

Although the AC power transmission technology performs generation and distribution of energy significantly well, some jobs cannot be performed with high efficiency and low cost. The DC technology is comparatively beneficial in various fields such as power transmission over long distances, power transmission between asynchronous grids, power transmission through cables, and carrying additional power without increasing the short circuit ratio.

Economic Benefits of High Voltage DC Technology
The total cost of stabilization of power transmission for very long distance is divided into five parts. These parts are tower cost, land cost, terminal cost, transmission line cost, and capitalized cost.

The DC power transmission system reduces the cost of various parts. The reductions in the cost of power transmission due to this system are as follows.

• Actually, the economic benefits are mainly dependent on the size of the tower. The size of tower required for this system is only 30% as great compared to AC power transmission.

• Due to the requirement of smaller size towers, this system requires 50% less land compared to the AC power transmission. The smaller land requirement enhances its economical benefits.

• The transmission line cost required for this system is 33% less than the cost required for the AC transmission system. This is because the DC transmission system requires a shorter break-even-distance.
Technical Benefits of High Voltage DC Technology

The main technical feature of the DC transmission systems is high controllability when compared to AC power transmission. The other features of the system are as follows.

Benefit in load flow

In the DC transmission system the load flow is totally controlled by the operators present on both sides. However, in the AC transmission system, the load flow is uncontrolled and depends on the actual network conditions.

Benefit in peak supply

DC transmission systems have inherent overload capability; rather they work actively for the peak load. On the other hand, the overload capability the AC power system is very low and not controlled by any means.

AC network connection stabilization

The AC network connection stabilization at the ends of the power grid is comparatively easier and more accurate in the DC power transmission system.

Current Applications of High Voltage DC Technology

The DC transmission system has various applications, but here are described the three most important applications of this system.

• **Submarine cable connections**
  The DC transmission system is best for cable transmission because of its symmetrical monopole configuration. Different cable designs are used worldwide based on this DC transmission. This system is used in such areas where submarine cables are required to connect to the main grid such as for energy platforms, offshore wind farms, island connections, and urban in-feeds.

• **Back-to-back transmission**
  The DC transmission system is very beneficial for back-to-back transmission in many aspects such as it doesn’t increase the short circuit power and restricts the spread of cascading disturbances.

• **Overhead line transmission**
  The most economical part of a DC transmission system is to use it in overhead lines. The overhead lines using this system require narrow transmission corridors, which decreases the cost.

Summary

The high voltage DC power system also has some other benefits such as an increase in stability of the AC system and parallel AC lines. Actually, this system provides benefits mainly for long distances as it minimizes power loss during transmission. This power system is best for seabed power transmission and was used in the shared 1961 **IFA power grid system of England and France**. The AC power transmission system is limited in various areas, whereas the DC power transmission system has various technical and economic benefits.
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