



High-voltage direct current is an electric transmission technology that uses direct current instead of the more widely used alternating current system. HVDC technology is often used to interconnect two AC systems that are not synchronized (not operating at the same frequency and in phase), to cross large bodies of water or to move large amounts of power over very long distances.

Transmission lines deliver electricity either as alternating current or direct current. Alternating current gets its name because it changes direction 60 times a second. Direct current does not change direction; it flows constantly in one direction.

HVDC technology enables the amount and direction of power flow to be controlled. These control characteristics can be used to improve the stability of the power system, since the power transfer across an HVDC line can be controlled as needed to damp power swings on the AC network.

Because AC is easier to convert to the voltage levels needed for homes and businesses, AC is most commonly used for electricity transmission and distribution. There are more than 100 transmission projects around the world using HVDC. According to the U.S. Department of Energy, there are several thousand miles of HVDC in operation in North America.

In some situations, HVDC systems may have advantages over AC transmission in terms of cost and power losses. The need for converter stations at each end of a line to transform power from AC to DC (rectification) and DC to AC (inversion) adds significant costs; the HVDC converter stations also contribute to the overall losses on the transmission system.

Primarily because of these factors, the use of the technology generally has been limited to projects that transfer power over very long distances and to underwater applications, in which DC cables are not prone to the rise in voltage that occurs with AC cable systems.

There are several HVDC projects in service in PJM, including HVDC merchant transmission interconnections between PJM and the New York ISO territory. Additional HVDC projects are active in PJM's interconnection queues.

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