

AC and DC Technology

Direct current (DC) technology allows a large amount of power to flow through a smaller transmission line corridor in comparison to alternating current (AC) technology. Benefits include increased operating efficiency and flexibility, decreased land impacts and enhanced reliability.

History of DC technology

In the late 1880s, a battle emerged between electricity pioneers George Westinghouse and Thomas Edison. The reason: Edison promoted DC for electric power distribution while Westinghouse was a proponent of AC distribution. More than 125 years later, Westinghouse's legacy is firmly established in the AC system that predominantly powers most North American (including Albertan) homes, farms and businesses.

But Edison's ideas also remain in the DC systems that today increasingly help move power over long distances in many parts of the world. Examples in Canada include:

- Alberta–Saskatchewan Interconnection installed in 1989.
- Quebec–New England Interconnection installed in the early 1990s.
- Vancouver Island Interconnection installed in the late 1970s.
- Nelson River, Manitoba bipoles installed in the 1970s.

DC systems include the high voltage direct current (HVDC) transmission lines used in Manitoba and Quebec, and also within the Pacific Northwest and California–Nevada areas of the U.S. HVDC lines can carry a large amount of power over even longer distances.

Benefits of DC transmission lines

DC is used for long distance transmission because it has some major advantages over AC.

Improved efficiency – All power lines experience line losses—power that is lost in the form of heat when a line is operating. DC transmission lines typically experience reduced line losses compared to AC lines meaning less power wasted and, as a result, better efficiency.

Smaller physical footprint – Two 500 kilovolt (kV) DC lines can transport a similar amount of power as three double circuit 240 kV AC lines. Additionally, DC towers usually require less space than AC towers of similar capacity.

Scalability – With DC lines, the amount of power the line can transmit can be increased by adding equipment at each end of the line. This decreases the need to build more power lines and lessens the impact on landowners if demand for power increases in the future.

The future of DC technology in Alberta

Alberta currently has no DC lines. However, the Government of Alberta has identified use of DC technology as a significant strategy to help strengthen the province's transmission system and achieve the following objectives set out in the 2008 *Provincial Energy Strategy*:

- "...build transmission...to zones of renewable or low-emission electricity."
- "...use, where possible, technology such as high-voltage direct current to maximize efficiency of rights of way and minimize impacts."

The Edmonton–Calgary Transmission System Reinforcement project will be the first transmission development within the province to use DC transmission technology. Identified by the AESO in the draft *2011 Long-term Transmission Plan*, it is one of four major transmission projects the Government of Alberta approved under the *Electric Utilities Act*.