



Looking Towards the Future: ***Advantages of 765-kV Transmission Technology***

In the electric transmission business, design plays a key role in the efficiency and productivity of the nation's energy delivery system.

Electric Transmission America, LLC (ETA) believes that high-voltage, high-efficiency transmission facilities are the cornerstone of efforts to maximize system performance while minimizing overall environmental impacts and system cost.

ETA's partners, American Electric Power (AEP) and MidAmerican Energy Holdings Company, are advancing the concept that high efficiency transmission systems should serve as the foundation for new transmission investment that will become the electrical equivalent of the national interstate highway system. By easing the loads on tired and often overtaxed transmission systems, ETA is looking to raise the bar on transmission design and system performance. In particular, ETA believes that 765-kilovolt (kV), extra-high voltage transmission offers a number of appealing technological and operational advantages for expansion of the nation's energy grid.

Resource Conservation

- A single-circuit 765-kV line can carry as much power as three single-circuit 500-kV lines, three double-circuit 345-kV lines, or six single-circuit 345-kV lines, reducing the overall number of lines and rights of way required to deliver equivalent capacity.
- The high capacity of 765-kV can easily facilitate the efficient and economical integration of large-scale renewable generation projects into the nation's transmission grid.
- ETA projects use a minimum right-of-way width of 200 feet for 765-kV construction. Standard industry right-of-way width for 500-kV is also 200 feet, and 150 feet for 345-kV construction. For equivalent power carrying capability, lower voltages require more lines and as a result more right-of-way.
- Typical 765-kV lines have a tower height of approximately 130-140 feet. This is 30-40 feet shorter than a typical double-circuit 345-kV tower.

Performance and Design Efficiency

- Power losses in a transmission line decrease as voltage increases. Since 765-kV lines use the highest voltage available in the United States, they experience the least amount of line loss.

- The greater transmission efficiency of 765-kV can be attributed mainly to its higher operating voltage (and thus lower current flow) and larger thermal capacity/low resistance compared to lower voltage lines. This also allows 765-kV lines to carry power over significantly longer distances than lower voltages.
- With up to six conductors per phase, 765-kV lines are virtually free of thermal overload risk, even under severe operating conditions.
- By shifting bulk power transfers from the underlying lower-voltage transmission system to the higher-capacity 765-kV system, overall system losses are reduced significantly.
- New 765-kV designs have line losses of less than one percent, compared to losses as high as 9 percent on some existing lines.
- The overlay of a 765-kV system allows for both scheduled and unscheduled outages of parallel lower voltage lines without risk of thermal overloads or increased congestion.

Minimizing Costs

- Use of 765-kV technology allows transmission builders to take advantage of economies of scale. A typical 765-kV line costs approximately \$2.6 million/mile. For equivalent capacity, three 500-kV lines at a cost of \$6.9 million/mile or six 345-kV lines at a cost of \$9.0 million/mile would be required. In other words, 765-kV construction is only 29% of the cost of 345-kV and 38% of the cost of 500-kV for a comparable system.
- Utilizing 765-kV results in a substantial reduction in system losses. For instance, a loss reduction of 250 megawatts, equates to saving as much as 200,000 tons of coal, and 500,000 tons of CO₂ emissions on an annual basis.
- The addition of 765-kV systems relieves the stress on underlying, lower voltage transmission systems, postponing the potential need for upgrades of these networks. This results in additional savings for end-use customers over time.

Our electric intensive society relies on the reliable delivery of power. By designing bulk power transmission systems to maximize efficiency and operational functionality, ETA is working to ensure that we can meet the energy needs of the nation's electricity users in a responsible and cost-effective manner.

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