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The effective ionization region and its variation with geometrical and electrical properties of the HVDC transmission system

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High Voltage Direct Current (HVDC) overhead power transmission trends are currently advancing toward high system voltages over very long distances in a bid to viably tap from remotely located renewable energy sources. Corona effect plays a very crucial role in the design of overhead power transmission systems. Through corona, part of the energy carried on the transmission line is expended through ionization and movement of charges in the air dielectric. Corona limitations influence selection of key line parameters such as diameter of phase conductors, the number of conductors per phase and conductor clearances to the ground. Since overhead transmission lines are installed in open air, the generated electric fields are non-uniform. As a result, the accompanying ionization in the surrounding air is non-uniform and does not occur throughout the inter-electrode gap. Instead, the ionization is confined to a very small region around the high voltage fitting referred to as the Effective Ionization Region (EIR). As such, corona power loss is proportional to the size of the EIR. This paper discusses the concept of effective ionization region from a theoretical perspective. Computer modeling was used to investigate the effect of geometrical as well as electrical line parameters on the size of the EIR. A comparison is made between single and bundled conductor configurations. Results show that the radius of the EIR of a single conductor that is energized at 800 kVDC drops by about 45

Level (Hons, MSc, PhD, other)?

PhD

Consider for a student award (Yes / No)?

Yes

Would you like to submit a short paper for the Conference Proceedings (Yes / No)?

Yes

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