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A New Simulator for HVdc/ac Systems-Part I

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Abstract: A simulator with optimal step time (SOST) has been designed to investigate Large HVdc/ac systems. The adequacy and robustness of the simulator will be demonstrated by showing some important applications relevant to operation, operational planning and medium-term planing. Some of the features of our SOST simulator are optimal step time algorithm, interpolation, chatter removal, MATLAB interface, unlimited size of ac system, and Farsi command that help model complex power electronic circuits, provide fast and accurate results. On account of its reduced calculation effort and deterministic execution time, optimal-step simulation is a prerequisite for real-time performance. However, when simulating electromagnetic-transients behavior, it introduces errors in the form of switching delays and inconsistent initial conditions. In order to eliminate these errors, the present paper describes a comparison of performance (the focus of numerical simulation) of traditionally simulation with SOST in large HVdc systems. A detailed simulation of HVdc converter behaviour has been modified to eliminate switching delays and calculate consistent initial conditions, even though switching time may not coincide with a calculation time-step and a circuit may pass through a series of simultaneous switchings. Furthermore, the SOST proposed has a simple decoupling technique to isolated parts of the circuit where the switching occurs in order to reduce the effort requird for the calculation of initial conditions.

Key Words: Large scale, HVdc/ac system, time domain analysis, dynamic behavior, power system simulation

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