ECEN 616 Project Parts 2-3, Fall 2022

Adam Birchfield, Texas A&M University, 10/29/2022

Part 2

Building on the circuit for part 1, there is another transmission line connecting Bravo and Charlie substations. This is a 10-km, single-circuit transmission line with horizontal configuration 20m above the ground, spaced 8m apart. Each phase contains a bundle of two ACSR conductors, separated by 26 cm. The conductors have an outside diameter of 2.1 cm and a dc resistance of 0.137 Ohms/km. There are two shield wires 0.945 cm in diameter, with a dc resistance of 3.375 Ohms/km, located 5 m above phase wires, centered and separated by 12 m. Assume ground return resistivity is 100 Ohm-meters. Use a frequency-dependent line model with validity from 0.1 Hz to 10 MHz.

Consider a BIL impulse wave consisting of the standard 1.2/50μs pulse with a peak current of 12 kA. This current will be injected into the A phase at Charlie substation and propagate along the transmission line to Bravo and Alfa substations. Assume that all three transmission lines and the capacitor bank are in service. What peak voltage levels do you see at each substation on each phase?

Part 3

Add a Metal-Oxide-Varistor (MOV) surge arrestor to the A-phase conductor at Bravo substation. To get the model for the MOV, in EMTP open the Example File under Options -> ApplicationCases -> Lightning -> arrester_model -> Zno_OB_258kV. Then use the ZnO1 object as it is designed in the example file. What is the impact on the peak voltages due to the lightning surge?