Simulations provide savings in an investment

Through simulations, the excess of planned surge arresters was verified, the real needed number was analyzed, and the solution was determined to prevent high overvoltages. Therefore the investment in equipments was smaller and the reliability of the system was increased due to the lesser number of equipment in the system.

Case Study no. 7: Verification of the number of surge arresters in a power plant

1. Summary

The original project of a new power plant had included, in the high voltage substation insulated with SF6, the installation of four (three-phase) surge arresters. The real convenience of those surge arresters for the protection of the transformers was studied.

The simulations demonstrated that three of surge arresters, included in the original project, did not give benefits in the protection of the transformers, therefore were not included in the final project. Thanks to the simulation, the costs of the protection system of the new power plant could be substantially reduced!

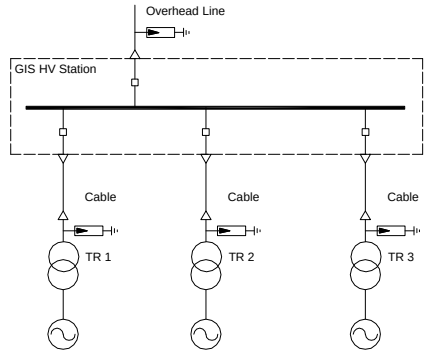
2. Description

Overvoltages in HV GIS substation

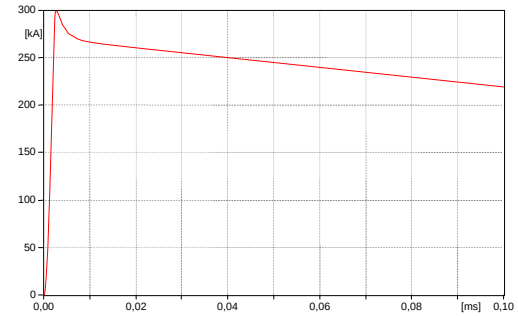
3. Technical challenge

- The statistical aspect of the atmospheric phenomena was considered with the aim to determine MTBF (Mean Time Between Failure) of the substation.
- The Corona effect of the overhead line was considered in order to obtain a realistic representation of the problem.

4. Results



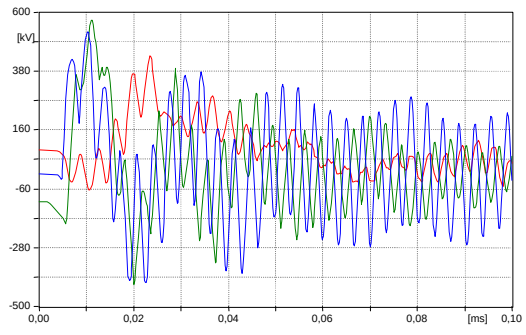
Original project



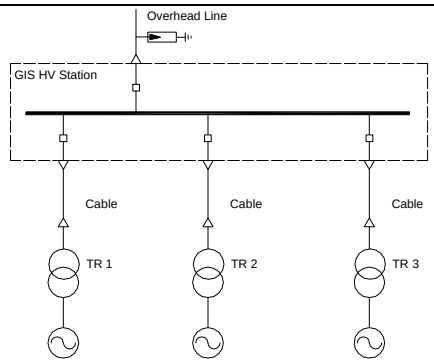
Lightning current

Step-up transformers	Expected number of faults per year	MTBF [years]
TR1 & TR2	0,00063	1630
TR1 & TR3	0,00059	1750
TR1	0,00002	> 10000
TR2	0,00001	> 10000

Simulation results with only one surge arrester



Overvoltages on the transformers



Final project

The solution was to eliminate from the project three three-phase of unnecessary surge arresters for the protection of the transformers.

5. Conclusions

Through the simulations a saving of 9 surge arresters was determined, with the addition of an increase of the system reliability due to smaller number of equipments connected.