

ELEC 0041: Homework 1 - due on March 3 2020

The upgrade of an existing electric power station requires the original high-voltage hollow copper tubing system (hollow tubes with 100mm exterior radius and 60mm internal radius) to be replaced with smaller-diameter solid (not hollow) conductors, which should be easier to manufacture and to install. The number and arrangement of the solid conductors is free, but should be realistic in view of engineering constraints.

The maximum (peak) voltage of the conductors is 550kV. The phase-earth distance (computed with respect to the lowest point of the conductors) is 5m.

Design a conductor arrangement for a single phase, that

- allows for the same ampacity (current) at 50 Hz;
- minimizes the maximum electric field (to avoid electrical breakdown at 3MV/m);
- is as compact as possible while minimizing cost and technical complexity.

As part of the design process, evaluate the interest (or lack thereof) of adding a dielectric layer around the conductors.

By groups of 2, write a 2 page report where you present and comment your results.

Send your report by email to cgeuzaine@uliege.be in PDF format together with your model files, bundled in a single .zip file. The file should be named: `hw1_lastname1_lastname2.zip`.