

## Coordinated voltage control of a decoupled three-phase on load tap changer transformer and photovoltaic inverters for managing unbalanced networks - DTU Orbit (08/11/2017)

### Coordinated voltage control of a decoupled three-phase on load tap changer transformer and photovoltaic inverters for managing unbalanced networks

The increasing penetration of fluctuating photovoltaic (PV) generation brings operational challenges for distribution system operators, such as introducing the voltage rise problem. The situation is made worse in the presence of single-phase generation being unevenly connected to the different phases. To address this problem, distribution transformers with single-phase tapping capability, together with reactive power provision of PV systems, are under investigation. This paper presents modeling and analysis of the benefits of coordinated voltage control of a decoupled three-phase on-load tap changer (OLTC) and photovoltaic inverters in a distribution system, for accommodating a greater number of photovoltaic generators in the grid. A 24 h root-mean-square simulation study is performed in the DigSilent PowerFactory with a 1 s time step using 10 min resolution consumption and production profiles on a real Danish distribution grid, as well as the developed dynamic photovoltaic generation and load models. The simulations show that the joint action of the power distribution transformer with OLTC control on each phase, and the reactive power provision of photovoltaic inverters, significantly improves the PV hosting capacity in the analyzed unbalanced scenarios without side effects, such as additional power losses, or significant neutral voltage rises

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