LABORATOIRE D'ELECTROTECHNIQUE ET D'ELECTRONIQUE DE PUISSANCE DE LILLE

Master project, 2020-2021

— Impact of unbalance and harmonics on grid-forming controlled VSC —

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Context

As the deployment of inverter-based generation becomes more widespread with mainly the on-going penetration of renewable energy production, the grid-forming control technique is increasingly seen as an appealing alternative to conventional grid-feeding control mode. Indeed, due to its multiple advantages (no need of existing voltage sources to function for example), the Grid-Forming (GFo) Inverter is a strong contender for large-scale deployment in future power systems. However, it is still unclear whether unbalanced conditions and harmonics can play an important role in the dynamics of GFo inverters.

Objective

The major objective of this work is to gain insight into whether **some unbalanced and/or harmonics conditions** influence or interact with GFo inverters network dynamics and to characterize these interactions.

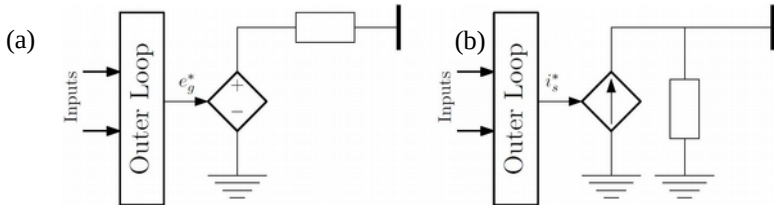

Figure 1: Simplified representation of controlled power converters: (a) Voltage source (Grid-forming), (b) Current source (grid-following)

Work steps

First, a state of art of grif-forming control will be carried out in order to understand its dynamic behavior and design a simulation model. An analytical model will then be developed, and a deep analysis will be made in case of unbalance and harmonics conditions. At last, the conditions that play an important role in the dynamics behavior of GFo inverters will be raised.

Keywords

Grid-forming, VSC, unbalance, harmonics

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