

Innovation type:
Methods and tools

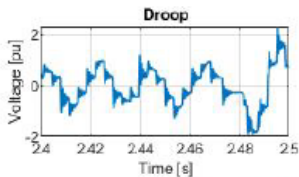
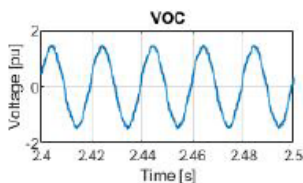
TRL: 3

Date: June 2020

Contact:
Oddbjørn Gjerde
Oddbjorn.Gjerde@sintef.no

Target group:

Actor/ purpose	x
DSO, TSO	
Technology provider	x
Member organisation	
Market operator	
Research/ Consultancy	x
Teaching	x



Instantaneous load voltage for
VOC and droop control under
strong grid coupling

Virtual Oscillator Control

Virtual Oscillator Control as an alternative to Conventional Droop Control in synchronization of power electronic converters in island microgrids.

Challenge

Synchronization in island electrical grids dominated by power electronics is a challenge due to the absence of a grid reference to follow, lack of inertia sources and the usual lack of communication among the units. The microgrid topology and the impedances between the individual buses may further impact the behavior of alternative approaches for load sharing and synchronization. Electrically close units may oscillate unless properly coordinated.

Solution

This work has investigated the instantaneous properties of voltage and frequency of Voltage Source Converters (VSCs) when they are controlled by Virtual Oscillator Controllers (VOC) in a distorted island grid. The results provide convincing evidence for the adoption of a more complex controller as the VOC in island grids that will naturally be more vulnerable to voltage distortions. This approach has been compared with the more widely adopted droop controller and shows improved synchronization properties where the converters are closely connected but at the expense of voltage quality. The results encourage further explorations into other potential benefits of VOC in island grids. Though there may be some challenges, the new approach synchronizes in cases where the classical droop control fails.

Potential

A new technique for synchronization of VSC in microgrids has been developed. This technique was successful in cases where the conventional droop controller failed. Such a controller may either replace traditional controllers or be used in combination with them to create more robust microgrid systems.

Reference in CINELDI

- M. Melby, M. Molinas, O.B. Fosso: "[Impact of Virtual Oscillator Control on the instantaneous properties of VSC output voltage in distorted island grids](#)", IEEE 45th Annual Conference of the IEEE Industrial Electronics Society, Lisbon, 2019.
- M.Melby: "[Comparison of virtual oscillator control and droop control in an inverter-based stand-alone microgrid](#)", Master-thesis, Dept of Electric Power Eng., June 2019.