## Finite-gain repetitive controller for harmonic sharing improvement in a VSM microgrid

J. Roldán Pérez; M. Prodanovic; A. Rodríguez Cabero; J.M. Guerrero; A. García Cerrada

## Abstract-

Electronic power interfaces are commonly used in microgrids for renewable energy integration and a control method based on a Virtual Synchronous Machine (VSM) represents an attractive alternative to conventional approaches. This control method has several advantages, however, a number of issues still need to be properly addressed, including those of power quality and harmonic current sharing. In this paper, a Finite-Gain Repetitive Controller (FGRC) is proposed to improve current harmonic distribution in microgrids based on VSMs. Stability, transient performance and performance under frequency variations are studied analytically. When compared to other control options, the method proposed here is capable of dealing with all harmonics simultaneously. A comparative analysis is provided to emphasise the contributions of this work. The control system improvements were tested on a prototype microgrid consisting of two 15 kVA VSMs, distribution line impedances and a non-linear load.

Index Terms- Virtual Synchronous Machine, Microgrid, Power Quality, Repetitive Controller, Harmonic Sharing.

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