

## 55. Title: A virtual synchronous machine for synchronizing three phase inverters with an electricity grid

**Inventor:** Prof. Bhim Singh, Department of Electrical Engineering

**Key Words:** Grid, Three phase inverter, Synchronous machine, Distribution grid

**Domain:** Power Generation & Distribution

**Summary:** A switching-vector based flexibly operated virtual synchronous generator (VSG) is provided for synchronizing three phase inverters in microgrids. The VSG comprises of a DC power source, a voltage source converter, reference voltage generator module, switching-vector controller, and a plurality of filters. The VSG predicts a future output voltage of the AC power by calculating difference between the future output voltage and reference voltage received from the reference voltage generator module. The switching-vector controller uses a minimization criterion to produce optimal inverter switching sequences. The VSG eliminates the traditionally used PI regulators and provides inherent islanding detection. It follows IEEE 519 standard.

### Advantages:

- » Provides over-current protection
- » Ensures zero error deviation from grid frequency
- » Mitigates harmonics effectively
- » Improves power quality
- » Provides effective synchronization with the grid as compared to existing synchronous machines

**Applications:** Energy management, Microgrid

**Scale of Development:** A prototype is developed and tested in simulated Laboratory environment.

**Technology Readiness Level:** 4

**IP Status:** Indian Patent Application 201911042199