An Improved Droop Control Strategy for Parallel Inverters in Microgrid

ABSTRACT

In this paper an improved droop control strategy for parallel inverters in microgrid was proposed. Aiming at the voltage sags problem caused by the introduction of virtual impedance, a double closed loop control method based on measured voltage feedback was employed for inverter control in the microgrid. Firstly, the frequency response character of the closed loop transfer function with virtual impedance and the inductive variation was analyzed in the frequency domain, indicating that the improved droop control method is necessary. Secondly, an improved droop control strategy based on inductive virtual impedance with measured voltage feedback was proposed. Lastly, the Matlab/Simulink simulation results show that the improved droop control strategy can not only solve the output voltage sags of the inverter, but also improve the accuracy of power allocation of droop control, maintain the system voltage and frequency stability. It is proved that the improved droop control strategy is effective.

KEYWORDS

1. Microgrid
2. Inverter
3. Droop control
4. Virtual impedance
5. Voltage sags

SOFTWARE: MATLAB/SIMULINK

BLOCK DIAGRAM:

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ELECTRICAL PROJECTS USING MATLAB/SIMULINK

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Fig. 1 Block Diagram of Droop Control Based on Inductive Virtual Impedance

EXPECTED SIMULATION RESULTS:

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Fig. 2 Operation Characteristics of Independent Microgrid in the Case of Casting or Cutting Load
CONCLUSION

Aiming at the shortage of the traditional droop control strategy, this paper proposes an improved $Q$-$V$ droop control strategy based on the inductive virtual impedance. Firstly, the frequency response curves of the closed loop transfer function of inverter control system based on inductive virtual impedance and the inductive virtual impedance variation on closed loop transfer function are analyzed in the frequency domain, indicating that the improved $Q$-$V$ droop control method is necessary. Then, the simulation experiments are built in parallel inverters operation model of two distributed generations, simulation results of two kinds of operating conditions show that the proposed improved $Q$-$V$ droop control strategy can eliminate the problem of voltage sags caused by the introduction of the inductive virtual impedance, improve the power allocation accuracy of droop control, and maintain the stability of the system voltage and frequency, so as to ensure the power supply quality of the independence microgrid system. Simulation results show the effectiveness of the improved $Q$-$V$ droop control strategy.

REFERENCES

