



A review of the islanding detection methods in grid-connected PV inverters

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ABSTRACT

Islanding is undesired because it may impair the safety of maintenance service workers and/or damage load equipment through unsynchronized re-closure. In principle, islanding detection is the monitoring of islanding—indicating changes in inverter output parameters or other system parameters. This paper aims to aid design efforts through its comprehensive review of islanding detection methods (comparing their non-detection zones and detection speeds) and anti-islanding standards. As a result, this paper shall provide a handful information and clearer vision for researchers to determine the best method for their product.

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Abbreviations: PV, Photovoltaic; DG, Distributed Generation; NDZ, None detection zone; PCC, Point of common coupling; Q_f , Quality factor; LPS, Load parameter space; PMS, Power mismatch space; $I_{n,0}$, Negative sequence current; OV/UV, Over/under voltage; OF/UF, Over/under frequency; PJD, Phase jump detection; ROCOP, Rate of change of power output; ROCOF, Rate of Change of Frequency; THD, Total Harmonic Distortion; PWM, Pulse Width Modulation; IM, Impedance measurement; PLL, Phase locked loop; SMS, Sliding mode frequency shift; DFT, Digital Fourier transformation; PI, Proportional Integrator; m_f , Modulation frequency; MPPT, Maximum power point tracking; VSC, Voltage source converter; UTSP, Unified three-phase signal processor; ST, S-Transform; WT, Wavelet transform; APS, Active phase shift; SFS, Sandia frequency shift; AFD, Active frequency drift; RPEED, Reactive power export error detection; PLCC, Power line carrier communication; T, Transmitter; R, Receiver; SPD, Signal produced by disconnect; SCADA, Supervisory control and data acquisition; V_{PCC} , Voltage at point of common coupling; V_{load} , Load voltage; Z_{PCC} , Impedance at point of common coupling; Z_{load} , Load Impedance; SNR, Signal-to-Noise Ratio; V_{smin} , Minimum pre-set voltage value; V_{smax} , Maximum pre-set voltage value; RPS, Real power shift; V_{smaxU} , A set point to detect islanding with RPS; VU_{avg} , Average voltage of 3 phase voltages; THD_{avg} , Average of total harmonic distortion of phase-A current; V_{avg} , Average line-to-line voltage; DWT, Discrete wavelet transform; DT, Decision tree; FGNW, Fast Gauss-Newton; FES, Fuzzy expert system

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