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OPTIMIZING POWER QUALITY: A FUZZY ENABLED APPROACH FOR PV-STATCOM IN GRID INTEGRATED WIND-PV SYSTEM

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ABSTRACT

The escalating demand for renewable energy sources has prompted extensive exploration into novel applications for meeting global power needs. Power contamination, emerging from contorting or non-direct loads and dispersed age, stays an essential test. This paper introduces a paradigm wherein a Photo-voltaic (PV) Solar Farm operates as a PV-Statcom, synergizing with a Grid-coalesced Wind-PV system to elevate power quality. Custom power gadgets like Stat-com assume a urgent part in killing significant power quality issues like waveform mutilations (music) and responsive power interest. In contrast to conventional approaches employing a Unit Vector Controller, this research employs fuzzy logic as the control strategy for the PV-Statcom. Fuzzy logic controllers are renowned for their adaptability in handling complex, nonlinear systems. The proposed fuzzy logic control strategy offers advantages in terms of dynamic response and adaptability to varying grid conditions. The controller considers multiple input parameters and makes decisions based on linguistic rules, tending to drive quality issues brought about by non-straight loads. The effectiveness of the fuzzy logic-based PV-Statcom control strategy is demonstrated through simulation results using Matlab/Simulink. The outcomes showcase an improvement in power factor and a reduction in Total Harmonic Distortion values, accentuating the capability of fluffy rationale in propelling power quality in matrix coordinated sustainable power frameworks.

KEYWORDS: *PV Solar Farm; PV-Statcom; Power Quality; Wind-PV; Fuzzy Logic; Total Harmonic Distortion.*

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