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Using Model Predictive Control in Renewable Energy Sources
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Abstract
The integration of renewable energy sources (RES) poses challenges due to their intermittent nature and the requirement for grid stability and reliability. This study explores the application of Model Predictive Control (MPC) as an advanced control strategy for effective RES integration. MPC utilizes mathematical models and prediction algorithms to optimize power flow, manage system dynamics, and mitigate the intermittent nature of RES. Simulations conducted using Simulink and MATLAB platforms demonstrate the effectiveness of the MPC controller in improving grid stability, optimizing power generation, and accommodating fluctuating RES output. The results highlight the potential of MPC to enhance the integration of RES into the power grid, paving the way for a sustainable and resilient energy infrastructure. Additionally, a comparison between the MPC controller and the Proportional Integral (PI) controller was performed, indicating that MPC outperforms the PI controller. © 2023 IEEE.

Author Keywords
Model Predictive Control (MPC); Proportional Integral (PI) controller; Renewable Energy Sources (RES)

Index Keywords
Controllers, Electric load flow, Electric power system control, Integration, MATLAB, Natural resources, Power control, Predictive control systems, Renewable energy, Simulation platform, Two term control systems; Advanced control strategy, Grid reliability, Grid stability, Integration of renewable energies, Model predictive control, Model-predictive control, Proportional integral controllers, Renewable energy source, Stability and reliabilities; Model predictive control

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