Analysis of Power Electronic Dominated Power Systems considering Low Rotational Inertia Scenarios

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Introduction and background:

Globally, modern power systems are experiencing countless issues majorly due to the replacement of classical synchronous generators with renewable energy sources (RES) to achieve net-zero CO2 emission by 2050. Consequently, the increased integration of RES does not meet the technological requirement of the classical synchronous machine thereby reducing systems inertia and poses a threat to system security. As a result, Power electronic converter (PEC) technologies are introduced to serve as a link between RES and modern power system

Problem description and objective:

This thesis aims to create intelligent frequency control strategies to withstand the issues produced by reduced inertia in modern power systems during normal conditions such as Fast Frequency Response (FFR) and abnormal conditions such as Under Frequency Load Shedding (UFLS) considering huge PEC penetration.

The main objective of this thesis is to critically examine the challenges facing the power system network with the growing amount of renewable energy sources and provide solutions to mitigate these challenges, model PEC technologies, select key performance indicators, and analyze the dynamic response of a power system interfaced with PEC technologies during normal and abnormal conditions.

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