

Modeling, simulation, and comparison of control techniques for energy storage systems

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Abstract-

This paper describes the modeling and formulation of a variety of deterministic techniques for energy storage devices, namely the PI, H-infinity, and sliding mode controllers. These techniques are defined based on a general, yet detailed, energy storage device model, which is accurate for transient stability analysis. The paper also presents a thorough statistical comparison of the performance and robustness of the considered control techniques, using stochastic dynamic models and a variety of disturbances and scenarios. The case study is based on a 1479-bus model of the all-island Irish transmission system and an energy storage device actually installed in the system.

Index Terms- Energy storage system, robust control, stochastic differential-algebraic equations, Monte Carlo method.

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