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Machine Learning-Based Techniques for Detecting and Mitigating Cyber-attacks on Automatic Generation Control in Smart Grids

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Abstract : The rapid growth of smart grid technology has brought significant advancements to the power industry. However, with the increasing interconnectivity and reliance on information and communication technologies, smart grids have become vulnerable to cyber-attacks, posing significant threats to the reliable operation of power systems. Among the critical components of smart grids, the Automatic Generation Control (AGC) system plays a vital role in maintaining the balance between generation and load demand. Therefore, protecting the AGC system from cyber threats is of paramount importance to maintain grid stability and prevent disruptions. Traditional security measures often fall short in addressing sophisticated and evolving cyber threats, necessitating the exploration of innovative approaches. Machine learning, with its ability to analyze vast amounts of data and learn patterns, has emerged as a promising solution to enhance AGC system security. Therefore, this research proposal aims to address the challenges associated with detecting and mitigating cyber-attacks on AGC in smart grids by leveraging machine learning techniques on automatic generation control of two-area power systems. By utilizing historical data, the proposed system will learn the normal behavior patterns of AGC and identify deviations caused by cyber-attacks. Once an attack is detected, appropriate mitigation strategies will be employed to safeguard the AGC system. The outcomes of this research will provide power system operators and administrators with valuable insights into the vulnerabilities of AGC systems in smart grids and offer practical solutions to enhance their cyber resilience.

Keywords : machine learning, cyber-attacks, automatic generation control, smart grid
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