IEEE TEMPLATE EXAMPLE

Adaptive Load Management Using Predictive Models in Smart Grid Systems

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Abstract: Smart grid systems increasingly rely on predictive control to manage variable demand and distributed energy resources [1]. This paper presents an adaptive load management approach based on machine learning models that forecast short-term consumption patterns. The proposed method integrates historical usage data with real-time system measurements to improve load balancing decisions. Simulation results demonstrate improved stability and reduced peak demand under varying operating conditions [2]. The approach is evaluated across multiple scenarios to assess robustness and scalability. The findings suggest that predictive modeling can enhance operational efficiency in modern smart grid environments while maintaining system reliability.

Index Terms: load forecasting, machine learning, smart grid systems, energy management

I. INTRODUCTION

Modern power networks face increasing complexity due to the integration of renewable energy sources and dynamic consumption behavior [3].

Traditional load management strategies often rely on static thresholds or predefined schedules, which limits their ability to respond to rapid changes in demand. As a result, system operators require adaptive methods that can adjust control decisions in near real time.

Recent advances in data availability and computational capacity have enabled the use of predictive models for power system optimization [4]. Machine learning techniques offer the ability to capture nonlinear patterns in consumption data and support more informed control strategies. Prior studies have shown that predictive approaches can reduce peak demand and improve system stability under variable conditions [5]. This paper investigates the application of predictive modeling to load management in smart grid environments, with a focus on improving balance between demand and available resources.