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Patent Search

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Abstract:

EMERGENCY SHUTDOWN OF WIND TURBINES UNDERCERTAIN CONDITIONS WITHOUT AFFECTING GRID USING IOT Abstract: The integration of wind turbines into the poses challenges, especially in scenarios requiring emergency shutdowns due to adverse environmental or operational conditions. The use of Internet of Things (IoT) can enable smart, responsive, and localized control of wind turbines to ensure safety without compromising grid stability. This paper presents an IoT-based framewo real-time monitoring and emergency shutdown of wind turbines under specific conditions, such as extreme weather events, mechanical failures, or grid instabilities. proposed system leverages IoT sensors, edge computing, and cloud-based analytics to monitor wind turbine parameters such as wind speed, temperature, vibration, status. These sensors communicate with a central control system, which employs predictive algorithms and predefined thresholds to detect anomalies. When a pote dangerous condition is identified, the system initiates a coordinated shutdown sequence.To maintain grid stability during shutdowns, the system communicates with operator in real time, enabling controlled and staggered shutdowns of individual turbines or turbine clusters, as needed. Additionally, energy storage systems (e.g., b grid support mechanisms are triggered to compensate for sudden drops in power generation. The IoT framework is designed to prioritize operational continuity and risk of blackouts, ensuring that renewable energy can continue to be a reliable part of the energy mix even in emergency scenarios.The results of this study demonstr IoT-enabled wind turbine management system can effectively handle emergency shutdowns, reducing response times and operational risks, and supporting a more energy grid. This solution is scalable, adaptable, and offers a model for enhancing safety in other renewable energy systems. Keywords:Wind Turbines,IoT (Internet o Things),Emergency Shutdown,Grid Stability,Real-time Monitoring,Predictive Maintenance,Edge Computing,Renewable Energy.

Complete Specification

Description:

Description: IoT-based Emergency Shutdown of Wind Turbines for Grid Stability

As wind energy continues to expand within the global energy mix, maintaining the reliability and stability of the power grid becomes crucial, especially during emer situations. This project aims to develop an IoT-based system that enables the safe and efficient emergency shutdown of wind turbines under specific adverse condi without compromising grid stability. The system focuses on utilizing real-time data, smart sensors, and automated control mechanisms to detect, predict, and respo potential hazards, thereby enhancing both operational safety and grid resilience.

Objectives

1. Real-Time Condition Monitoring: Implement IoT-enabled sensors on wind turbines to continuously monitor critical parameters, including wind speed, temperat vibration, mechanical load, and grid connectivity. This data will be collected in real-time, allowing for immediate analysis and response.
2. Predictive Anomaly Detection: Use predictive analytics and machine learning algorithms to assess data from turbines, identifying potential failures, hazardous or other abnormal conditions that may necessitate a shutdown.
3. Automated and Staggered Shutdown Mechanism: Develop an emergency shutdown protocol that enables controlled and phased shutdowns of turbines to pre abrupt drops in power supply to the grid. This includes coordinating with energy storage systems to fill temporary gaps in power generation.
4. Grid Communication and Stability Support: Integrate communication protocols that allow the wind farm control system to coordinate with the grid operator. In emergencies, this system can initiate grid support measures to maintain balance, including activating energy storage reserves or curtailing power from other source

View Application Status

Department of Industrial Policy and Promotion
Government of India