Fault Resilient Communication Network Architecture for Monitoring and Control of Wind Power Farms

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Abstract— **Real time monitoring and control of wind power farm (WPF) require a highly reliable communication network infrastructure. The monitoring and control can be guaranteed through the communication network by using redundant resources and ensuring quality of service (QoS) for different applications. In this paper, we study and simulate fault-resilient network architecture for monitoring and controlling of WPF. First, communication network topologies are explored. Then we propose a fault-resilient communication network architecture which consists of three different levels: (1) data generation level, (2) data aggregation level, and (3) control center level. Each level is defined by its function, physical location, network topology, communication link bandwidth, redundant nodes, and links. In accordance to IEC 61400-25 standard, the monitoring traffic of wind turbine is classified into critical and non-critical data according to the required QoS. Due to low cost, non-proprietary standard, and guaranteed real-time services, the Ethernet technologies are currently used in various industrial applications. Several network failure scenarios based on Ethernet technology are used to simulate the network architecture through OPNET. The performance of the network architecture is evaluated on the basis of the amount of received data, end-to-end delay, and data loss at control center. The simulation results show that the communication network architecture can guarantee the transmission of WPF critical data.**

***Keyword*— Communication Networks; IEC61400-25; Monitor and Control; Reliability and Resiliency; Wind Power**

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