WIRELESS SENSOR NETWORK FOR SMART GRID TRANSMISSION SYSTEM

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Abstract
Wireless Sensor Networks are a vital component of the next-generation electric power system, the smart grid. In smart grid application the sensors are required to operate for very long duration, years or even decades after they are deployed. A self-powered WSN placed on high voltage power line in tunnels and powered by a magnetic generator scavenging energy from the magnetic field has been designed and tested.

The smart grid is a modern electric power-grid infrastructure for improved efficiency, reliability, and safety, with smooth integration of renewable and alternative energy sources, through automated control and modern communication technologies. Hence, there is an urgent need for cost-effective wireless monitoring and diagnostic systems that improve system reliability and efficiency by optimizing the management of electric power systems. Integration of accurate monitoring tools will enable accurate ampacity estimation which will lead to efficient utilization of the power lines. In Figure 1 a review for sensor applications is described for transmission lines and substations.

Wireless sensor are powered by a harvesting system that exploits the magnetic energy, autonomously performs the measuring functions and transmits data to other sensors until it reach the gateway node. Because the wireless sensors deployed in power lines are located at great distances from the gateway, each sensor node has to route the incoming data from other sensors to the gateway. To overcome this issue, we develop an optimal time synchronization method for the wireless sensors that can self-adjust the communication timing in order to minimize the total power consumption. For keeping accurate clocks and also low power consumption at distributed wireless nodes the protocol has been developed based on modified IEEE 1588 standard for time synchronization.
The system has been designed for measuring the air temperature and humidity, the cable temperature and current and fault detection and transmits the measured data, with Xbee modules installed in a linear topology to a receiving unit. Appling the temporal multiplexing technique of the data transmission, the wireless modules receive data from other nodes, measure and transmit data forward to the gateway with a sampling period of 10 s and time accuracy of microseconds.