Power System Communications

Baseband Transceiver Design of a 128-kb/s Power-Line Modem for Household Applications

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Abstract: Communication using a power line as a medium provides a convenient and inexpensive way for data transmission and control signaling in households. This paper introduces a power-line channel model as well as architecture of a spread-spectrum baseband transceiver IC for a power-line modem. The modulation and spreading scheme used in the proposed transceiver is mary biorthogonal keying (MBOK). This transceiver runs at a chipping rate of 256 KHz and provides 128-kb/s data rate. Simulation results and FPGA emulation verify the effectiveness of the architecture for household data communication.

Classification of Power Systems Communications Needs and Requirements: Experiences from Case Studies at Swedish National Grid

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Abstract: Broadband data communications capabilities are introduced to a great extent among electric utilities. Installation of fiberoptic systems makes it possible to provide high-speed communication capacity links and to replace vintage, low-rate equipment. Ways in which the new possibilities should be most effectively utilized have not been fully investigated, however. Communication requirements must be further analyzed. This kind of work has been started at the Swedish National Grid. An approach for classifying various requirements is presented. Typical requirements are ordered into three different classes, reflecting the degree of importance of various communication needs. The classification has a functional standpoint rather than a traditional technical focus. Even though the classification is coarse, it has proved to be a proper basis for data- and telecommunication-strategic considerations.

Application of Peer-to-Peer Communication for Protective Relaying

Working Group H5 of the Relay Communications Subcommittee—Power System Relaying Committee

 Abstract: This paper presents a series of protective relay applications that use peer-to-peer communications to transmit data among protective relays and other intelligent electronic devices (IEDs). Applications are selected from various categories such as transmission line, transformer, breaker, bus, substation, and distribution feeder.

Power System Instrumentation and Measurement

230 kV Optical Voltage Transducers Using Multiple Electric Field Sensors

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 Abstract: 230 kV optical voltage transducers were constructed and tested. These transducers use three electric field sensors whose positions and outputs are selected and combined, respectively, in accordance with the quadrature method to obtain a voltage measurement. They meet IEC 0.2% class specifications and maintain 0.2% class accuracies even in the presence of electric field disturbances caused by local changes in geometry external to the transducer. The local changes in geometry used in the testing mimic those that may occur in a substation, e.g., installation or movement of equipment.

Power System Operations

A Coordinated Real-Time Optimal Dispatch Method for Unbundled Electricity Markets

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 Abstract: A coordinated real-time optimal dispatch method for unbundled electricity markets is proposed in this paper. With this method, the pool energy auction market, ancillary services market, and bilateral contract market can be coordinated by the ISO through a balancing market for the purpose of system security. To meet real-time imbalance and to eliminate transmission congestion, operating reserves, curtailment of bilateral contracts, and supplemental energy bids in the real-time balancing market can all be called upon in light of their bidding prices. The replacement of the operating reserves used to provide balancing energy is incorporated into the objective of the real-time optimal dispatch problem. A modified P-Q decoupled optimal power flow is employed to implement this method. Spot pricing for the real-time dispatch is presented. The IEEE 30-bus test system and the IEEE RTS-96 test system are studied to illustrate the proposed framework.

Controlling Grid Integrity After Power System Emergencies

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 Abstract: An emergency strategy for dealing with multiple contingencies that can lead to system voltage instability has been incorporated into a program for studying post-disturbance power system dynamic events. Pattern recognition allows simple logic for a practical and reliable means of safeguarding the grid and offering a means for preventing the multimillion-dollar collapses that befall worldwide interconnected systems. The proposed automatic arrangement only needs