SOLUTION PAPER

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Bringing Self-Awareness to the Grid

SCADA Systems Enhance Electric Utility Operations

Electric utilities worldwide are incorporating Smart Grid solutions to improve supply reliability and power quality, better balance the distribution feeders, and reduce operating and maintenance costs. Many of these goals can be achieved by adding or enhancing existing Distribution Automation (DA) solutions for the medium voltage (MV) power grid to improve the management of remote electric equipment.

Typical medium voltage power grid site

Remote Monitoring & Control

For many years, Load Break Switchgears (LBS), Circuit Breaker Reclosers (CBR) and municipal substations were designed for operation by utility personnel without remote control. Today, advanced Remote Terminal Units (RTUs) such as the Motorola ACE3600 can be integrated with wireless data communications to provide more efficient power grid operation. While these RTUs primarily control the remote MV distribution equipment, they can also communicate with co-located Intelligent Electronic Devices (IEDs) that perform tasks such as: power factor monitoring and fault detection via direct connection to 3 phase voltage and current sensor devices connected to the MV grid.

For example, the CBR control unit integrates an IED, which detects the fault, instantly trips the switchgear and blocks the flow of fault current. This event is communicated through the RTU to the Distribution Management System (DMS) control center, which can take automated or operator-initiated action to isolate the faulty section and restore power to the healthy parts of the grid.

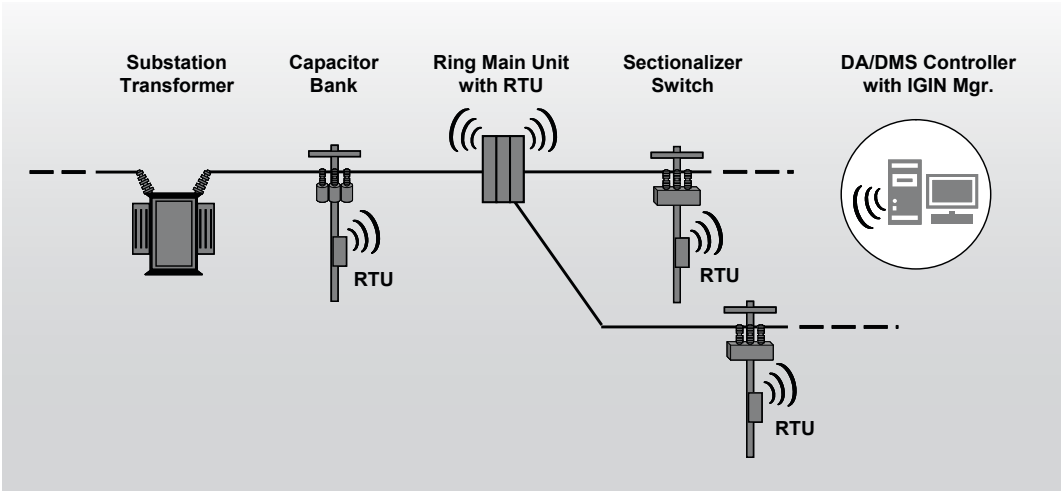
Smart Grid Operation

The Smart Grid initiative encompasses a wide variety of efforts involving remotely monitored and controlled equipment, whose implementation demands a comprehensive understanding of how power grids operate. Furthermore, Smart Grid design requires reliable, networked and secure data communications to allow seamless and instant control of remote equipment by the DA / DMS computer system.

DA systems use a variety of wired and wireless communication media. Complex DA systems may combine several media types, each optimally selected for a particular segment of the communication network.

Once reliable and secure data communication for the SCADA system is available, the next step is to add intelligent application operation at the remote sites (RTU level) as well as at the DA/DMS control site. Use of intelligent application software increases the operating intelligence and help to achieve a greater return on investment.

The future of the electric utility industry will depend on how its leaders transform the grid from a "passive" network of wires, poles, substation transformers and other hardware to a self-aware intelligent and controllable Smart Grid system.



Medium voltage power grid enhanced with intelligent control

ACE3600 RTU with IGIN software can provide remote monitoring and control at multiple locations within the distribution grid.

IGIN Smart Grid Application Software

The Digitalogic Intelligent Grid Interface Node (IGIN) can transform the operation of the power grid. Integrated with ACE3600 RTUs it adds intelligence to the control of remote installations, enhances the performance of the entire system, and converts the vision of Smart Grid into a reality.

IGIN patented technology operates at strategic sites along the MV power grid as a smart application. The IGIN software enables intelligent, secure and efficient power grid reconfiguration by interfacing directly with IEDs that control capacitor banks, transformer tap changers, protection relays, etc. The IGIN software application protects against obsolescence in a world of constant changes by making the operation of the Smart Grid system independent of vendors of these devices.

The IGIN application software offers a unique built-in password verification process and a control tracking system that ensures an unprecedented level of security and protects against execution of unauthorized commands.

The Distribution Data Management System (DDMS) consolidates the communication channels that provide access to field devices and manages the aggregation and distribution of real-time data. Through the use of advanced configuration and diagnostic tools, the IGIN Manager streamlines the processes of deployment and troubleshooting.

The IGIN auto restoration feature enables the transformation of the entire MV power grid into a smart, seamless real-time data network. Here, MV power grid faults are detected and isolated and power delivery service is automatically restored to unaffected segments of the distribution network while meeting all operating procedures and conditions established by the utility.

Motorola ACE3600 RTUs

The ACE3600 RTU integrated and the MDLC protocol is crucial to the implementation of high-quality Smart Grid solutions. Its unique hardware, software, remote programming and wireless networking capabilities make the DA/DMS system a long lasting success.

ACE3600 provides reliable peer to peer (RTU-to-RTU) and peer to master communication, allowing smart fault handling and an extension of the geographical coverage for remote sites without a direct link with the repeater and are not located with the DA/DMS control center.

ACE3600 RTUs are designed for wide geographical area SCADA-data communication (hardware, software, protocol) and can be upgraded remotely with new features to accommodate changes to maintain reliable system wide operations.

ACE3600 RTUs have built in capability to emulate other vendors' data protocols, allowing the DA/ DMS control center to communicate with a wide range of RTUs and IEDs over the network. Using the IGIN software, ACE3600 can interface to substations using ICCP and other protocols.

ACE3600 RTUs perform seamless connection between 2 or more wireless or wired media, allowing for cost-effective geographical coverage extension. It performs Store and Forward (S&F) operation with a single radio frequency or may combine several media to create a seamless, communication network.

ACE3600 RTUs with MDLC protocol can operate in polling or reporting by event modes via multiple media. When simultaneous events/ reports occur, these RTUs have the built-in capability to quickly and reliably clear that condition.

ACE3600 & IGIN - Converting the Vision of Smart Grid into Reality

The Digitalogic IGIN solution operating on MOSCAD and ACE3600 RTUs is an existing and field proven solution which has enabled utilities to realize their vision of a Smart Grid. Use of IGIN applications, integrated Motorola ACE3600 RTUs and MDLC based data for SCADA communication results in many benefits for IT and telecom, substation automation, SCADA and EMS:

- Faster detection and correction of faults reduce financial losses and improve company goodwill by minimizing interruption of electric power supplied to customers.
- Remote control and monitoring of the MV power grid parameters (voltage, current, energy, power quality, etc.) provide means for more intelligent decisions by operators.
- Proactive and convenient preventative maintenance can be provided at reduced costs based upon changes in operation details supplied by the SCADA system.
- Integrating a large quantity of remotely installed power grid equipment via a utility-owned wireless or wireless network with ACE3600 provides a reliable and cost-effective system.

Most utilities employ some sort of DA system today and realize some quantitative savings. Smart Grid solutions with Motorola add RTUs and IGIN software to those savings and help achieve a better and quicker return on investment.

The United States Department of Energy (DOE) has received substantial funds from the American Recovery and Reinvestment Act to encourage utility investment in upgrading their grid to smart status. Equipment like ACE3600 RTUs, IGIN software and Motorola high-speed radio communications can be integral to that improvement.

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