Power Stability Expert

| Case Study |

Philippines First Digital Substation by NR

Next Step Towards Smart Distribution Network Technology

Overview

The Valencia digital substation is the first fully digital substation project of Meralco and it is also the foremost digital substation implemented and energized in the Philippines. Meralco is the largest distribution company in the Philippines covering 36 cities and 75 municipalities, serving over 6 million customers. Adoption of a digital substation brings major benefits in terms of designs, installation and operation, which ensures elevated levels of security, quality, reliability and availability of electric power and minimize operation and maintenance costs while maximizing efficiency.

NR Solution

Valencia substation is entirely GIS 115 KV-34.5KV substation consists of 115kV and 34.5kV Protection and Control IIED's, Bay Controllers, Breaker Simulators using Bay Controllers, Routers and Switches, HMI Servers, Gateways and RTU, Time Servers, Merging Units and Breaker Control Unit, there are totally seven 115kV GIS breakers and seven 34.5kV breakers in switchgear, with one 83MVA power transformer. As the solution provider, NR offers dual-star redundant network to ensure the reliable data exchange between station layer and process layer, the design called for the devices to be directly connected to the Ethernet LAN. The Substation LAN is configured in a ring topology with Ethernet switches installed in the cabinet.

In the process level, NR has offered PCS-221 Merging Units (MU) to connect with conventional CT/VT and convert analog I/U into digital I/U, and PCS-222 Intelligent Control Unit (ICU) to acquire binary input states and execute binary output commands to circuit breaker, isolators and earth switches. For the 115kV side, two Merging Units and two Intelligent Control Unit are equipped for each bay, with the first unit for Main 1 protection, and the second unit for Main 2 protection. The redundant network ensures reliable exchange of IEC61850-9-2 SV and GOOSE messages in process level.

IEDs can be installed in the substation according to the requirements. In the bay level, NR has offered thorough protection and control solutions, with protection management system to provide effective protection for the power system equipment in the substation. The protection system covers Transformer Protection PCS-978, Busbar Protection PCS-915, and Line Differential Protection PCS-931, etc. The bay IEDs are connected to the switch using copper cables. Longer switch-to-switch connections between bays are accomplished via fiber optics that support the ring topology. All the protection and control IEDs acquire sampled values and exchange GOOSE messages via process bus.

The station level encloses substation monitoring system, gateway, GPS Time Receiver, etc. The station level equipment provides online condition monitoring of major power equipment in the substation, including power transformer, 115kV/34.5kV GIS equipment, AC/DC power supply and all the secondary components of the IEC 61850 system. It also integrates some transformer condition-based monitoring devices that are 61850 ready into the system. The PCS-9700 all-in-one monitor system is composed of monitoring host, data server and comprehensive application server. Remote access to the engineering workstation, protection management system is also provided.

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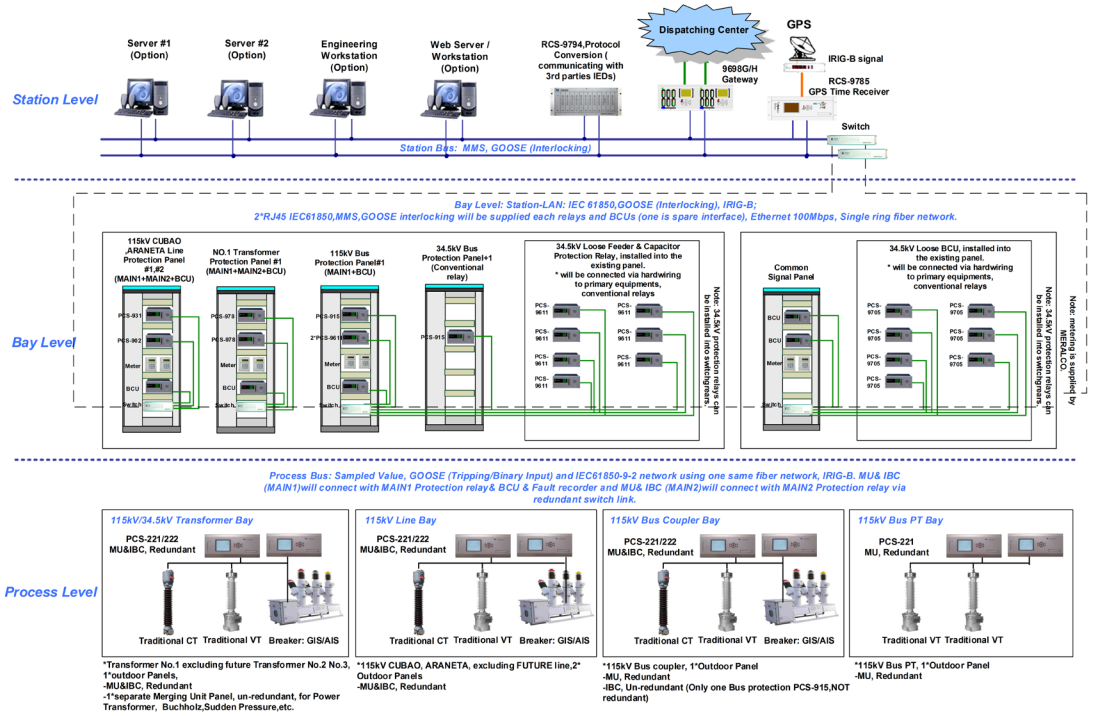

Customer Benefits

Up to now, the Valencia substation has been smoothly and efficiently operating for almost three years. With the functionality of remote monitoring and control, this substation operates as an unmanned substation making it more responsive during normal operation. NR's digital substation solution has captivate maximum benefits during engineering, installation and operation:

- PCS-9700 automation system integrates the applications of protection, control, Ethernet, IT and communication technologies based on international standards.
- Bulk amount of copper wiring between IEDs and primary equipment in conventional substation are replaced with optical fibers, which is cost-effective for the initial investment, and making regular maintenance more convenient.
- The process bus with GOOSE and IEC 61850-9-2 is adopted, realizing the transmission of sampled values, state information, tripping/ closing commands and interlocking command.
- IEDs connected in a star fashion with switches connected in a redundant fiber-optic ring provide the most reliable and dependable substation LAN.

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