

PS2 - Applications of emerging technology for protection, automation and control

Question 2.02 What are the expected benefits of using digital substation concepts and how to meet these benefits during industrial application?

Utilities expectations and roadmap in the application of an IEC 61850 solution in a full digital substation

The IEC 61850 standard revolutionized the way we implement protection, automation and control systems in a substation. The system configuration based on a data model and communication protocols radically changes the electrical cable infrastructure for an Ethernet network. This impacts primary equipment, civil infrastructure, the time required for implementation and the way of designing, maintaining and operating the system. The application of these technologies is already happening in several companies in Brazil and in the world. But the technology itself is not an objective, but a means to improve the reliability, costs and resilience of the power system.

The changes strongly impact the knowledge base of the teams, the organization of the companies, the requirements and procedures involved in the processes and the management of the technological convergence of information technology (IT) concepts applied in the technology of operation (OT). Therefore, it is not enough for the technology to be available – companies need a strategy so that its implementation is done safely and in a way that the advantages that a full digital substation can offer are obtained. In Brazil, as of 2004, solutions based on the IEC61850 standard began to be adopted at the Station Level implementation (control room). The second step – the implementation of the standard in the substation yard (Process Level) – has a much greater impact, as it implies that voltage, current, status and command signals, which were electrical, will now be acquired via communication. We will have electronic devices in the yard, measuring instruments based on optical conversion and a much simpler infrastructure in terms of cabling, based on an Ethernet network.

It is important to establish a Roadmap :

- Evaluation of technologies involved in the implementation of a digital substation
- Pilot projects in partnership to evaluate solutions, technologies and maturity of available products
- Proposition of strategies to apply digital technologies in substations
- Recommendation and definition of functional requirements for the application of digital substations
- Evaluation of impacts on design, maintenance and operation processes in the company
- Recommendation of a qualification plan for the teams involved in digital substations
- Monitoring and evaluation of standards and procedures defined by regulatory bodies.

The expectation of the companies can be summarized in the following table:

Changes	Impacts	Benefits	Consequences
Digitalization IED Local Communication	-Qualification -Convergence of IT, Telecom, Automation and Protection areas -Changes in company organization -Remote Access Investment (WAN)	-Better control over infrastructure -Easier for system changes -Faster to test -Telecontrol of facilities -Enables remote work -Low electrical Risk for team	-Smaller maintenance and operation teams -Fewer team trips -Higher speed to get work done -Fewer work accidents
LPIT	-Qualification -New maintenance routines	-Non risk for explosion -Easier to move and install equipment -Low electrical Risk for team	-Increased power system availability -Fewer work accidents
Virtualization	-Qualification -Investment in computational infrastructure	-Better infrastructure and service management	-Increased availability of protection and automation systems -Higher speed to restore system to crashes or cyber attacks
Asset Management	-Qualification -Systems Acquisition	-Real-time asset management	-Equipment, team and service cost management
Cybersecurity	-Qualification -Impact on work procedures -System Acquisition (SOC)	-Security and governance improvement	-Company Business Protection -Improved Company Image -Compliance with government policies
Analytics	-Qualification -Investment in equipment and systems	-Incorporation of intelligence into systems -Data collected analyzed -Immediately actions to power system conditions -Immediately Availability of information and diagnostics for expert teams	-Rapid response to power system control and protection actions improving availability -Fast response of maintenance in times of unavailability