

## **EUR24\_08 - Lessons Learned Through Commissioning, Livening, and Operating Switchgear Part 2**

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### **Abstract:**

The 500 MW expansion of a facility's power system, incorporating 12 000 protective relays and modern technologies in a radial scheme and a breaker-and-a-half scheme, requires special attention. Potential errors during the constructing, commissioning, livening, and synchronizing of new facilities with an existing power system can lead to safety incidents and/or a loss-of-production event to the existing facility.

The events presented in this paper cover individual power system elements, such as incorrect delta link placement on a transformer, challenges in the testing and starting up of large direct-on-line motors, a yard modification leading to an arc-flash trip, and a broken overhead optical ground wire leading to a line-to-ground fault. More complex system events included systems used for synchronizing to and decoupling from the electric utility.

The paper elaborates on communications-based IEC 61850 protection systems and the dependence on managed Ethernet switches for communications between intelligent electronic devices.