The Australian electricity transmission company Powerlink Queensland owns and operates Queensland’s high voltage electricity transmission network. In this digital substation project, ABB drew on its extensive experience with non-conventional instrument transformers (NCITs) to replace the originally installed proprietary process bus with IEC 61850 technology and connected the primary (high-voltage) equipment to the substation protection and control devices more effectively, improving the reliability and availability of the optimized substations.

In 2011 the first commercial process bus installation, the so-called digital substation, was successfully put into operation. This first digital substation outside of China was only the first of a series of six outdoor substations with process bus and NCIT technology. The second and the third substations were put in service in 2013 and 2014 respectively.

In this project, Powerlink Queensland makes use of the SAS600 station automation system from ABB, Relion® 670 series protection and control IEDs and the REB500 distributed busbar and breaker failure protection system.

All protection and control equipment in the system are connected to the IEC 61850-9-2 process bus and receive analog sampled values from the CP-MU merging units also supplied by ABB. New sensor electronics connect the MUs to the existing combined current and voltage sensors. This approach allowed the refurbishment of the primary technology to be kept to a minimum.

Thanks to the integrated redundancy of the NCITs from ABB, two completely independent systems of merging units and protection equipment were implemented to meet the customer’s redundancy requirements.

The replacement of copper wires by fiber optic cables and the description of the transferred information according to IEC 61850 opened new opportunities for intelligent testing tools to support the commissioning and maintenance of the substation.

**Additional experience in digital substation**

In addition to the described projects, ABB installed several pilot installations to prove further products from ABB’s digital substation offering, like FOCS, the optical current transformer and to help customers gain experience with this technology.
Device | Function
--- | ---
**Process level**
ELK-CP | Non-conventional redundant instrument transformers for current and voltage measurement in gas-isolated switchgear
CP-MU | IEC 61850-9-2 merging unit for ELK-CP non-conventional instrument transformers
**Bay level**
REC670 | Bay control IED
REL670 | Line distance protection IED
RED670 | Line differential protection IED
RET670 | Transformer differential protection IED
REB500 | Busbar and breaker failure protection system
**Station level**
RTU560 | Communication gateway to control center
MicroSCADA Pro | Substation automation system
**Auxiliary facilities**
Building | Transportable building for protection and control cabinets, automation system and auxiliary facilities

Customer benefits

The modernization of the installations with the latest technology in accordance to IEC 61850 supports Powerlink Queensland in its mission to responsibly deliver electricity transmission services that are valued by shareholders, consumers, customers and the market.

**Safety**

Improved safety is one of the key gains from digital substations: Non-conventional instrument transformers are free of oil, which removes the risk of explosions. Replacing secondary wirings with optical data exchange, eliminates the danger associated with open CT circuits and of electrical hazards in general.

**Compliance**

These deliveries bring Loganlea Substation into full compliance with the most advanced global standard for substation automation, maximizing availability and grid reliability.

**Future-proof investment**

With demand for electricity growing fast, Queensland needed to further build on long-term, cost-effective solutions for its power system. By upgrading the substation with advanced automation and the latest communications standards, ABB helped Powerlink to fulfill its strategy well into the future.

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