GRID AUTOMATION

Taking network control to the edge in China – Pudong.

FDIR Fault Detection Isolation Restoration with RTU540.

With our proven solutions in distribution automation grids we offer basic and advanced solutions for improving the operation efficiency and providing an improved quality of power supply, by reducing the outage times to a minimum.

The RTU540, remote terminal unit is the perfect product enabling these solutions. Incorporates advanced features like programmable logic control and a human machine interface allowing for instant insight into the status of the grid. The high-quality, compact metal housing includes input and output modules which lead to space savings in the control cabinet.

- Effective fault management of the distribution network
- Minimization of the amount of energy not supplied
- More efficient utilization of the distribution network by minimizing network losses
- Improved operational efficiency through better tools for operators and field crew
- Enhanced quality of power supply through less and shorter outages limited to a restricted part of the distribution network
- Least number of outages in the event of faults

Think of Shanghai, of the bustling financial markets and the soaring skyline, and you are certainly thinking of Pudong. The financial district is home to the Shanghai World Financial Center, and the iconic Oriental Pearl TV Tower, but mostly its home to five million people, the majority of whom work in the financial sector which is driving the Chinese economy. Financial markets don’t sleep, or take holidays, and they can’t do without reliable power, so Pudong needed a power delivery system flexible enough to serve those markets, and cope with future expansion, and fast enough to respond automatically when things go wrong.

SCADA systems provide centralized management, controlling the flow of power over the entire grid, but a good manager knows when to delegate.

Empowering subordinates to make decisions is vital in keeping a business responsive, and so it is with a power network – when decisions have to be made quickly then they’re best made by those closest to the action.

Delegation is only possible with trust, which is where ABB’s remote terminal unit, RTU540 comes into play. With a reliable heritage and wide-scale deployment the RTU500 series has proven it can deliver the five-nines (99.999%) reliability Pudong is asking for, and with the addition of the multimeter 500CVD21 it gains the senses it needs for autonomous fault detection, isolation, and recovery.
In practice that means sensing when a fault has occurred, before it has been cleared from the protection, then coordinating with the other RTUs to isolate the broken link and restore power to the available network. This process takes less than 15 seconds, despite the complexity of the negotiations required, and with the fault properly isolated an update can be sent to the SCADA system for holistic examination, and the dispatch of a repair crew.

Each RTU can only detect its local flow, but maintains a map of the network and communicates with the other RTUs. That communication uses IEC 61850, taking advantage of the industry-standard in robust digital communications, and ensuring compatibility with future deployments.

A line fault will result in a trip from the protection IED in the feeding substation, cutting supply to a large part of the network, but with multiple substations feeding into the grid there will still be power elsewhere, enabling the RTUs to locate the line fault without resorting to human intervention.

The network is split into sections, separated by switches under RTU control with each section taking feeds from two distribution substations. A fault within a section results in the circuit breaker being thrown, de-energizing the entire section, but RTUs close to the distribution substations can see that they’ve still got power and by coordinating with other RTUs they can work out exactly where the fault lies.

Once the fault has been found then the RTUs either side can open a switch, isolating the fault automatically. Once the broken line is safely isolated a message is sent to the circuit breaker asking it to close, and, thanks to the decision making capabilities of the RTUs, power is restored to the almost all of the operational network in less than 15 seconds.

Pushing intelligence to the edge of the network enables fast decisions, and creates a robust infrastructure, as long as central control has complete trust in the subordinate systems. Deciding when to restore power is critical to any network, and generally left to a human operator, but with RTU500 series from ABB the decision can be made quickly and efficiently, keeping more customers connected for more of the time, which is what you need if you’re supplying power to a region like Pudong.