ABB Ability™ Smart Power for underground mines
Flexibility, advanced control and digitalization to power distribution

The primary aim of underground mining operations is to maximize productivity while ensuring the safest possible working environment.

Traditionally, power distribution networks in underground mines have suffered from limited information and a lack of flexibility when it comes to daily control and operations management. They usually only have a rudimentary power network control system or are operated manually.

What’s more, outdated power distribution hardware increases the probability of more and more power outages and associated reduced availability. This all adds up to additional costs and greater safety risks that could be avoided with modern power distribution solutions.

ABB’s Smart Power solution for underground electrical substations resolves these challenges in an unrivalled way. The basic solution includes a containerized underground distribution substation with all hardware installed in e-House, forming a robust underground electrical room. As one special characteristic of underground mines is continuous expansion, a Smart Power substation is especially suited to this environment as it can be relocated as needs change.

The main hardware inside e-House is chosen to support connectivity and communication to modern mine control system such as ABB 800xA, which means the substation can be remotely controlled and monitored from a control room.

Characteristics of electrical power distribution in underground mines
A typical power distribution network in an underground mine faces numerous challenges such as:

- A lack of equipment control and monitoring makes it impossible to supervise network conditions and identify distribution bottlenecks
- A lack of power and energy readings makes it difficult to monitor available network capacity, peak loads and load levels of critical equipment
- Network outages after faults tend to be prolonged as fault tracing is difficult
- Network protection lacks operation speed, reliability and selectivity
- An underground mine is often continuously expanding that imposes special requirements on power distribution
- Generally very harsh condition for equipment

Smart Power is ABB’s solution to meet these challenges.
Smart Power substation configuration

A typical Smart Power substation configuration includes a portable, tough and compact e-House with ABB’s superior built-in components such as:

- SafePlus MV switchgear
- Relion protection relays
- Dry power transformer
- MNS 690 VAC and MCS 400 VAC switchgear for main and auxiliary low voltage distribution
- ACS880 frequency converters
- Communication panel connected to electrical hardware that enables communication between different electrical substations and the control room using modern communication protocols such as Modbus and IEC-61850

The e-House can be uniform or split-type. Uniform solutions can be used for surface installations and the e-House can also be transported underground by truck.

If the e-House can only be transported underground by the hoist shaft, the associated space constraints mean a split-type e-House design will be necessary.

In which case, the e-House is split into separate specially designed blocks to fit into the hoist shaft for transport underground. The uniform, compact and portable e-House is then reconfigured in situ underground by loading the blocks onto a chassis and connecting them mechanically.

The chassis is specially designed to facilitate transport and relocation of the e-House underground. And as the low voltage cables inside the e-House come ready assembled, LV cables on site can be directly connected to cable connectors on the outside of the e-House. This enables quick and easy cable connection underground.

Customer benefits

ABB Smart Power substation solutions help customers in the mining industry not only reduce capital expenditure and operating costs but also increase safety at the same time.

Smart power is a preconfigured e-House solution based on bay-typical philosophy and standard container layouts. This enables fast engineering and commissioning and lower project costs.
A uniform 800xA based mine control system for both process and power distribution control increases equipment availability, makes mine control transparent and reduces the need for upgrades and spare parts.

**Step into digitalization**

Smart Power solutions bring power distribution control in underground mines into the modern digital age. As other industries such as Oil & Gas have discovered, modern communication and integrated solutions to control both power and processes simplify everyday operations, improve safety and save costs.

Practically all relevant information from power distribution equipment is available in the mine control system enabling more efficient decision making and information sharing, which leads to faster troubleshooting and shorter outage times in the event of faults. The enhanced and centralized monitoring environment in the control room can also be managed by fewer operators.

Smart Power solution also improves safety in natural way as most routine daily network control and parameterization work can now be done remotely in addition to troubleshooting and post fault analysis. Alarms and warnings can be logged in time and corrective measures implemented early enough to prevent power distribution outages and associated safety hazards. Versatile protection functions included in Relion relays and communication between IEDs also make for superior network protection in terms of speed, selectivity and reliability.