Underground Distribution Substation
Vault design, packaging and procurement services

Safety, reliability and resiliency are top priorities for electrical utilities. In many cases, utility personnel working in underground electrical vaults face a variety of potential hazards, including electric shock resulting from air insulated equipment, unsafe air quality and extreme flooding from severe storms. ABB delivers safe, reliable and resilient distribution substation solutions that protect personnel and equipment, and provide superior performance at the height of a storm or flood using robust technologies that can withstand extreme conditions. ABB is your best choice for assessing the condition of your present underground system, recommending and designing a reliable, resilient and safe solution, and then delivering a complete upgrade of your underground vault network.

Challenges for underground distribution networks
Many underground utility networks were installed decades ago, and typical practice is to replace equipment only when it fails. Underground primary equipment - switchgear, transformers and isolators - was originally designed with open air electrical connections that pose huge safety risks for utility personnel. Underground vaults are vulnerable to storm flooding, and traditionally rely on submersible pumps to ensure flood water is evacuated. Paramount to a fast recovery following severe storms is reliable, resilient equipment that can operate during and after severe weather events, and restore power quickly. An added challenge is the limited availability of skilled utility resources experienced in designing and rebuilding robust underground vault networks.

ABB solution
Underground vault migration services
The ABB team can leverage its engineering services to assess the present state of your vault network and provide a comprehensive migration strategy for a new solution including switchgear, transformer apparatus and control system. The migration strategy will define your critical environmental, operational, automation and visibility requirements. ABB’s experienced team will consult with your utility team to develop a vision of grid modernization based on key drivers like safety, reliability, resiliency and cost.

Features
- Assessment and consultation of existing underground vault and grid modernization needs
- Submersible switchgear and transformer products that can operate in flooded vault conditions
- Design of underground utility vault systems for improved safety and operations
- Submersible control and monitoring equipment provide vault control/condition status to field personnel at street level and the remote network control center
- Battery backup system solution that enables switchgear operation during outage conditions

Benefits
- Experienced team: design and specification experience in underground vault modernization.
- Improved reliability: robust submersible switchgear and transformer products can withstand flooded vault conditions.
- Improved resiliency: submersible control system can operate and report telemetry during severe storm flooding.
- Improved personnel safety: switchgear control from outside the vault, reducing staff risks of working in a restrictive space.
- Improved operation: battery backup maintains report and control capacity if vault loses main electric power.
- Improved visibility of vault water levels ensuring pump and drainage systems are working.
Solution description
Engineering services for underground vault applications: The engineering and design of compact and submersible switchgear utilizes ABB’s Elastimold switches and interrupters, enabling dead-front technology for enhanced personnel safety and ensuring continued operation after severe weather events. Services include assessment of applications for switchgear, transformer and interconnections that provide modular and scalable design for more flexible underground vault solutions.

Engineering services for automation and control: The engineering and design of switchgear control and protection utilizes ABB’s Relion REC670 bay controllers. ABB is experienced in utilizing the REC670 as a comprehensive multi-object controller, which can integrate 4, 5, and 6-way bay control of underground vault switches and interrupters. Automation and accessibility to the vault equipment is engineered by accessing the switchgear controller via RTU540 and TropOs3320 wireless radio. The underground vault interface design enables easy access for field personnel at the site, and remotely via the network control center. A key feature of the submersible control cabinet is its capacity to operate during vault de-energization and in flooded vault conditions.

Enabling products experience
• Submersible switchgear – Thomas&Betts Elastimold switches and interrupters
• Submersible underground commercial transformers
• Switchgear control – ABB Relion REC670 or REF615
• Remote Terminal Unit – ABB RTU540
• Wireless communication – TropOS wireless radios
• ABB-designed submersible control cabinet and backup battery system

Points to consider
• Does your system have underground vault networks?
• Is the equipment more than 20 years old? Are exposed conductors inside the vault?
• Is personnel safety important to your company?
• Do dangerous vaults increase risks to personnel?
• Does your existing equipment lead to poor reliability indices?
• Are automation and communication systems installed in your underground distribution network?
• Are you considering installing or upgrading to a DMS?