GECOL - Libya
Overall communication network for Libya’s electrical Transmission and Distribution grid

Reference

GECOL (General Electricity Company Of Libya) is the electric utility of the Great People’s Libyan Arab Aljmahiriya. Over the last ten years, GECOL has more than doubled its energy production and the future promises an even faster growth.

To run the power grid from the 400 kV level down to the distribution network in a highly reliable and efficient way, a state of the art utility communication network with TDM- & LAN-services was planned and the implementation began in 2007. More than 300 stations are already in place and many more are about to follow.
About GECOL

GECOL (General Electricity Company Of Libya) is the electric utility of the Great People’s Libyan Arab Aljmahiriya. It is solely responsible for the generation, transportation and distribution of electric power in the whole country.

It operates more than 30 electricity generation plants, mainly steam and simple-cycle gas-turbine units and diesel generators in rural areas. The available installed generating capacity in the existing plants is 5500 MW. The current system maximum demand is about 4000 MW.

GECOL is also the sixth largest operator of water desalination plants in the world. More than a billion US$ will be invested in more than nine desalination units over the next decade.

The future vision is focused on reinforcing the GECOL infrastructure by utilizing modern technologies in the fields of generation, transmission and distribution. To run its core-business in a commercially and technically very demanding environment, GECOL has selected ABB to install a highly reliable communication network throughout Libya.

Preparing for the future

Libya’s power consumption is predicted to double by 2014. To cope with this growth, GECOL plans to spend up to 13 billion US$ over this period on its electrical infrastructure. Due to its geographical position, many interconnections to neighboring countries are planned.

Building new lines and substations is just one challenge. Managing and maintaining such an extended fast growing network is another. GECOL is expecting to commission its state-of-the-art national control centre, which will operate and control the entire high-voltage power grid and Libya’s cross-border interconnections. In addition, ten new distribution control centers are about to be realized.

Communication is key

Most projects for new substations or extensions are awarded to international main contractors, who handle such orders as isolated task. To manage the power grid however, all these sites have to be interconnected by some means of communication to exchange e.g. SCADA data or to provide voice communication. New services need to be added to existing communication installations and while new ones are expected to be fully backward compatible. Designing and implementing a country-wide communication network to serve the electrical transmission and distribution level is complex task. The list below highlights just a few aspects to be considered.

Scalability & granularity

Scalability has different dimensions. On the one hand, GECOL was looking for a solution which is scalable product-wise as the expectations about communication devices for the backbone along the 400/220 kV-grid are very different from those used in distribution networks. On the other hand, scalability is related to the possible granularity of bandwidth allocation to the various services.

Redundancy & Availability

Loss of communication especially at backbone level carries a high risk of loosing control over the country’s power-grid. Like in GECOL’s case, where teleprotection for 400/220 kV lines is transmitted over the fibre-optic network, powerful hardware- and traffic-protection features need to be supported. In addition, the fibre-optic equipments has to work hand in hand with e.g. Power Line Carrier equipments (PLC) for mission critical services.

Multi-Service & User expectations

While a few years ago, in many utilities the IT and communication teams were strictly separated, nowadays they team up to benefit from the latest technology combining TDM
and packet services. GECOL has decided to use ABB’s FOX family as a multi-service platform to run their IT services over the same equipment that is used for handling the operational services of the power network. Combining the very high and diverse expectations of the various user groups within a utility is definitely a challenge.

Network Management & maintenance
State-of-the-art utility communication has changed from point-to-point links to complex network topologies. Handling not only TDM connections but also LAN traffic adds a new dimension to the management complexity. As the country’s power supply finally depends on a properly working communication system, the Network Management System plays a key role in setting up and maintaining the network.

Alternative transmission technologies
Especially in the field of communication at the distribution network level, technologies other than fiber optic can be considered. GECOL initially intended to use WIMAX to serve small, remote stations with IP services but due to the lack of frequencies and licenses, alternatives were selected. For teleprotection applications at the 400kV level, power line carriers from ABB’s ETL family are installed as a backup for fiber-optic services.

Environmental conditions
Utility communication devices are expected to operate in harsh environments. Many sites have limited air-conditioning and the network elements have to remain operational up to 55°C and more. Furthermore, the installations have to fulfill stringent EMC requirements to cope with the hostile electromagnetic environment of substations.

GECOL relies on ABB Solutions

This brochure presents a snapshot of various ABB projects for GECOL or its main contractors. They are related either to the 400/220kV backbone or to the distribution level.

400/220 kV Backbone Communication
GECOL’s fiber-optic backbone is based on ABB’s FOX515T Utility Multiplexer. It covers the full range from E1-connectivity up to STM-16. Several of the more than 30 stations make use of FOX CWDM capabilities and ABB’s extra-long haul solutions using boosters and preamplifiers. Repeaterless spans of more than 250km are in place and support the complex network topology that allows sophisticated traffic protection schemes on top of the FOX515T full hardware-redundancy.

Distribution level communication network
Based on the customer’s positive past experience, in 2006 ABB was also awarded the design and implementation of GECOL’s communication network for the distribution level. The ten defined regions are allocated to the same number of distribution control centers (DCC). They are served with STM-4 rings based on nearly 100 FOX515Xs. The FOX515Xs are aggregating the traffic of about 400 FOX515Ds spanning STM-1 sub-rings. The SDH network with its fast protection schemes serves as a very robust carrier mainly for LAN services. VLANs with guaranteed transmission capacity and deterministic propagation delays for VoIP, SCADA & IT are used to provide the required services to the various user groups. VoIP applications are handled by a PABX in each DCC handling up to several hundred users.
The Senior Chief-Engineer for GECOL-networks comments:

“With its services, GECOL contributes to the wealth and successful growth of Libya. A resilient multi-service communication network is the key to operating the 400kV grid in a highly reliable way and to distribute the energy efficiently even in dispersed areas. The various internal users of the network have very different requirements ranging from mission critical teleprotection services up to high-capacity IT applications. ABB has an in-depth understanding of GECOL’s business and the FOX family covers all the needs at the transmission as well as the distribution level.”