

## Distribution network protection

### New network configurations

The development in distribution networks has resulted in changed requirements for protective systems. Distributed local generation and plans for operating distribution networks in closed-ring configuration makes it necessary to re-evaluate the protection systems.

### Existing relays are insufficient

The existing overcurrent (O/C) relays are no longer able to protect the future systems, and several problems are identified:

- In radial networks with more substations or RMU's along a line, O/C delays may assume unacceptable values ( $> 1-2s$ ).
- By far-end-faults at long radials, fault currents may be very low leaving the O/C relays useless.
- Distributed generation results in reverse low-level fault currents, and the traditional O/C relay protection systems may fail.

### Alternative relay types

Line-differential relays are often found in old interconnected 11-33kV systems. They are however quite insensitive, or need high quality communication. At their best they offer poor protection or poor backup to other system components like busbars and adjacent lines. Even if they used to be popular they are no longer optimal in distribution networks.

Impedance relays are ten times more sensitive than O/C or traditional line-differential relays, and with uncomplicated trip logic they offer undelayed tripping. Impedance relays can also supply excellent protection for busbars and adjacent lines, and the backup capabilities are good.

- Impedance protection in distribution systems dramatically improves operational flexibility:
  - Open rings can be permanently closed
  - The open-ring point of partition can be moved without changing relay settings
  - Local generation can be installed without complications to the network protection
- Impedance relays offer better performance than traditional distribution protection systems.
- Reduced installation and operational cost by when using genuine user-friendly relays
- Uncomplicated and affordable distribution impedance relays are available.

Distance protection is assumed to be the best protective solution in new interconnected distribution networks, especially if they also include local generation.

### Most modern relays are complicated

Modern protective relays are usually very complicated to apply. Over 1000 parameters is common, and compared to the traditional electromechanical relays with 10-15 settings this represents a serious problem. Configuring and testing a relay lasts far too long, and the risk of setting faulty parameters is very high. Fault statistics confirm that the number of setting errors has increased dramatically.

### RefleX protection - Straight to the point

A range of protective relays named "RefleX" is available including an advanced measuring system, and an extremely uncomplicated user-interface. With only 15-30 parameters they can be installed, set and operated with a minimum of training and effort. The limited number of settings greatly reduces the risk of choosing wrong parameters.

An impedance relay has been designed to the RefleX range, offering optimal economical and technical performance in more complex distribution networks.

For further information please study the article "Impedance relays in distribution networks",

More information is also available at:

[www.jacobsen-elektro.com/PR\\_selec.htm](http://www.jacobsen-elektro.com/PR_selec.htm)