Feeder automation based on IEC61850
Feeder Automation based on IEC61850

• Design of a decentralized solution based on the coordination among different IEDs distributed along MV lines and the use of IEC 61850 GOOSE communication services to accelerate the decision taken
Background

- **28% of the malfunctions** of protection functions are already caused by **wrong configurations** according to the North America Electric Reliability Corporation last report.

- Changes in topology for fault restoration and congestion management.

- Impact of high rate of DG connection on protection systems operation: Blinding effect, unnecessary operations, Failing autoreclosing, unintended islanding...
Inflection point

- Application of IEC 61850 standard for feeder automation
- Current trend of replacing switches by breakers along distribution feeders
- Frequent changes in network configurations to fulfil optimization functions
- Protection system reliable operations in networks with DER and DG connection
IEC 61850 Protection Function Parameters Update

• Objective
  Process to change remotely functional parameters and data subscriptions in peer to peer communications without interrupting operation

• Schema
  • Protection, monitoring and control functions modelled with standardized Logical Nodes
  • Embedded Logic at IED level for dynamic reconfiguration
  • Use of MMS messages to update:
    • LN setting values
    • GOOSE ID subscriptions
Decentralized IEC 61850 FLISR Solution

Included Use Cases
- FLISR using auto re-closers
- FLISR based on distributed control
- Islanding protection using communication command
- Configuration of IEDs

IEC 61850 parts, as of 2013
IEC 61850 future parts (already engaged)

*: use of IEC 61850 over WAN can/will take advantage of IEC 61850-80-1, IEC 61850-90-2 and IEC 61850-8-2 (web based), and IEC 61850-90-12 (WAN)
Decentralized IEC 61850 FLISR Solution

• Objective

Decentralized FLISR Schema based on IEC61850 GOOSE messages that contemplates different interruption technologies at distribution level, islanding mode protection and new IEC 61850 guidelines

• Schema

• Decentralized logic selectivity using GOOSE messages
  • 1st Isolation Step – Performed by IEDs controlling circuit breakers.
  • 2nd Isolation Step – Performed by IEDs controlling switches.

• Loss of Mains Protection by means of IEC 61850 messages controlled by MV IEDs

• MMS messages to report status and interact with SAU algorithms
Decentralized IEC 61850 FLISR Solution
Islanding of microgrids

Background

Microgrids may operate either connected to the distribution grid or as a standalone power system.

Interaction with the distribution system must be taken into account.

The breakthrough is the proposal of a protection device that coordinates with distribution grid based on ICT.
Islanding of microgrids

Features of Interconnection Switch

Coordination with MV FLISR protection system.

The microgrid protection system uses IEC 61850.

Communication-Failsafe autonomous operation of the interconnection switch.

Automatic reclosing upon distribution grid restoration.
Breakthroughs Expected Results

- Reducing the number of customers affected by the supply interruption
- Reducing restoration times
- Improve reliability and safety of protection systems