Towards MV networks automation

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- Purposes
- System Architecture
- Event Synthesis Function
- Fault Location Function
- Network Restoration Function
- Implementation Policy
- Automation of the process
- Outlooks
Purposes

- Context analysis
  - Larger area to control
  - Recrudescence of climatic events which are often damageable for distribution network
  - Higher weight of outage regulation and contractual issues

→ Help is required and specifically in case of wide-area events

- A global system to
  - help operator to efficiently handle faults on the network
  - Minimize duration of outages
  - Improve customers service quality

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System Architecture

- An « EDF made » SCADA (incl. HMI)
- A single complete description of the MV network handled by a unified configuration tool
- A DMS system using a SW bus
- A single link between the « 2 worlds » (to ease independant evolutions)
Event Synthesis Function

- ESF continuously interprets each event on the network
- ESF produces synthetical information on the fault
- ESF elaborates RICH & CONTEXTUAL fault diagnoses (permanent, transient, homopolar, resistive, polyphase fault) for a real help for the operator subsequent isolation and restauration actions
- ESF allows to reduce the number of events presented to the operator
- ESF identifies and reports on faulty devices / processes thus allowing the utility to enter into a vertuous improvement process of its networks
Fault Location Function

- FLF is invoked to locate the fault on a feeder following the analysis of ESF and using fault detectors.
- FLF can manage failing and inconsistent detectors.
- FLF presents the result of location to the operators in the network MMI.
- FLF makes commands proposal to isolate the faulty section.
Network Restoration Function

- Activation after the effective isolation of the faulty part
- Calculation of restoration plans for any MV incident, whatever the state of the network
- Allowing feeder reconfiguration
- Proposal of restoration plans in the network MMI

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Deployment Policy

- Experiment Phase in several Control Centers
- Huge preliminary work to:
  - Achieve a non ambiguous identification and standardisation of signals from RTUs
  - Improve the reliability of acquisition systems (i.e. fault detectors)
  - Update and improve the Assets description quality and completeness
- A stepwise approach:
  1. Manual invocation of FLF and NRF: familiarisation phase for end-users (indispensable since Control habits are greatly impacted) and prerequisites validation
  2. Fully automated restoration process
Automation

- Workshop with end-users to specify the automation process
- Design of the automated process taking into account the technical and security rules
- Impact with MMI and Alarm processing
- Upgrade the SCADA to include the capability of dealing with control sequences
- Critical situations «real life process» to cope with; i.e.:
  - Bad location of the faulty area requiring return to last valid state
  - Failure of isolation commands extending faulty area
  - Failure of restoration commands requiring new calculations,
  - Etc..
Outlooks

• The phasing schedule for all French Control Centres
  – December 2008: deployment of ESF
  – May 2009: deployment of FLF and NRF in « manuel mode »
  – January 2010: deployment of automated restoration

• Upgrade existing functions to take into account voltage plans and dispersed generation.

• Design a state estimator for MV network.

• Take advantage of AMM and contribution to SmartGrids
  – MV and LV network much more observable allowing proactive operation
  – Use of Advanced Metering Infrastructure (AMI) for operation purposes & needs coverage (siwtches, detectors, …)
  – Coupling between centralized et dispersed network control